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The Slime-Filtering Decision

One of the metallurgical patent disputes of the first magnitude was concluded last week by the decision of the U. S. Circuit Court of Appeals for the Third Circuit in the case of the Moore Filter Co. vs. the Tonopah-Belmont Development Co., which in effect was the Moore filter vs. the Butters. This case had been pending for many years and had been the subject of many wars of words, both within and outside of the courts, being a case of the same magnitude as those respecting the cyanide process, the mechanical roasting furnaces, and the still pending flotation process. Butters won in the Circuit Court, Moore appealed and has now won in the higher court. The main part of the decision handed down by Judge Buffington, which upholds the validity of U. S. patent 764,486, granted on July 5, 1904, to George Moore, is given elsewhere in this issue of the JOURNAL.

The decision is extraordinarily sweeping. This is no matter of a particular apparatus, but rather the upholding of the broadly claimed process of slime filtration outlined by Mr. Moore in his patent specifications. "After a careful study of Mr. Moore's patent," says Judge Buffington, "We have reached the conclusion that his process is a radical departure from the whole prior art and was an original and pioneer step in metal recovery by filtration. Like all important inventions its merit is its simplicity, and its novelty consists in his utilizing the simple elemental processes of nature. These processes he has, of course, neither discovered nor invented, but he has utilized them in combination in a manner never before used and has thereby secured a new result."

Being of the opinion that Moore's process was novel, useful and inventive in character, and that his patent is valid, the court turned to the question of infringement, taking up the fourth and fifth claims as furnishing sufficient basis for deciding that question insofar as the device of the defendant in this case is concerned. These claims are as follows:

(4) A filtering process comprising submerging a filtering medium in a material to be filtered, drawing the liquid being filtered from said material through said medium until a deposit of solids is formed upon the medium, removing the medium from the material being filtered, further impoverishing the solids by a cleansing operation, and removing the solids from the medium by passing a cleansing current through said medium.

(5) A filtering process comprising submerging a filtering medium in the material to be filtered, drawing the liquid being filtered from said material through said medium, removing the medium while continuing the drawing action, passing a cleansing fluid through the medium, and then passing a cleansing current through said medium.

The court held that the Butters filter infringed both of these claims. Manifestly the decision of the court is so broad that many of the other slime filters are put in jeopardy.

The decision of a circuit court of appeals in a patent case is commonly final in present practice, patent cases being no longer open to appeal to the Supreme Court in the former way. Decisions of a circuit court of appeals may be brought to review by the Supreme Court by certiorari, but the Supreme Court is unlikely to take up the case unless there has been some abuse of power or flagrant mistake by the lower court. However, the decision of a circuit court of appeals is binding as legal precedent only within the jurisdiction of that particular court. By the introduction of new and material evidence a new trial may be inaugurated within another circuit, and if carried to its court of appeals and there awarded a decision contrary to that rendered in the other court of appeals, the case may be taken to the Supreme Court, which under these circumstances would undoubtedly accord to it a hearing. Such a sequence of events is, how-

ever, unusual, and probably the slime-filter case may now be taken as settled.

With this decision the Moore Filter Co. will have a great power over the mining and metallurgical industry. Much will depend upon the moderation and good judgment with which this power is exercised. Infringers of the Moore patent will probably have to make up their minds to pay the owner of that patent for the use of it. If the aforesaid owner is temperate, and better yet, lenient, it will probably reap the best of the reward to which the Court of Appeals has declared it to be entitled. If, on the other hand, it adopts a harsh policy and attempts to exact an exorbitant toll, it will probably realize least in the long run. Probably there is no patent that cannot, and will not, be broken or circumvented if the public be pushed to the extremity.

Iron Contents of Lake Superior Ores

An interesting series of tables has been published by the *Iron Trade Review*, giving shipments and analyses of iron ores from the Lake Superior region over a series of years, and showing a steady decline in the average iron contents of those ores. It is true that these contents show an average decrease of 3 to 5% only; but a loss of even 1% on the Lake shipments, which will probably reach 50,000,000 tons this season, is a matter of considerable importance.

Those familiar with the iron-ore situation at the Lake Superior mines, have long realized this condition. The decline, however, has now reached a point where practical recognition of the facts must be made, and it is expected that this will lead to a further lowering of the guaranteed metallic iron content of the ores, which forms the basis of sales. Prior to 1907 the base for Old Range bessemer ores was a hypothetical ore, containing 63% metallic iron, 0.045% phosphorus and 10% moisture, giving a natural iron content of 56.70%. In the same period the base for nonbessemer ores was a hypothetical ore containing 60% metallic iron and 12% moisture, giving a natural iron content of 52.80%. An exception to these was Mesabi nonbessemer for 1905 and 1906, when the natural iron content was 53%. Before the 1907 sales were made, the bases were changed. The hypothetical ore for Old Range and Mesabi bessemer became one having 55% metallic iron and 51.50 for Old Range and Mesabi nonbessemer.

The average percentage of iron in the total shipments of bessemer and nonbessemer ores from the old ranges, has decreased from 56.3991 in 1902 to 53.5859 in 1911; and from the Mesabi Range from 56.0663 in 1902 to 51.1842 in 1911. The decrease is occurring much more rapidly in the Mesabi ores than in the Old Range ores, and this is accompanied by a proportionate increase in the phosphorus content. In 1902 about 80% of the Mesabi ores shipped were bessemer, while in 1911, the percentage was only 50 per cent.

The rapid decline in the grade of the Mesabi ores means much for the other ranges. The Michigan ranges will again assume more importance and will offer more attractive fields for exploration than they otherwise might. In doing this, they will fulfill the predictions that have been made by several iron-ore experts in recent years. In Minnesota, both the Cuyuna and Vermilion ranges will benefit, as it will tend to put them on a more nearly competing basis. The next few years will undoubtedly witness a marked revival of activity on the Vermilion, and a great expansion of exploration on the Cuyuna. Not the least effect, however, will be to stimulate interest in the search for successful methods of treating low-grade ores on all the Lake Superior ranges, both in the United States and Canada. Sufficient advances have been made along this line of late years, to indicate that the problems are going to be solved satisfactorily, and probably before long.

The Copper Statistics

The report of the Copper Producer's Association for October shows that the refinery production, which is now about in step with the smelters', will probably continue to run over 140 million pounds per month; and that this is in excess of the present demand, wherefore the accumulation is likely to continue to increase. The smallness of the exports in October was because Europe had been supplying itself out of its own accumulation, which it was able to do on more favorable terms than America offered. The extraordinarily large American deliveries were due in part to the forwarding of supplies of Lake copper in anticipation of the closing of navigation, and perhaps to anticipatory shipments from other quarters. Really the statistics of the mouth are less favorable even than they look, but in a consideration of the figures month by month, no very sound deductions may be drawn.

The Mexican Situation

The recent silence of the daily newspapers respecting revolutionary affairs in Mexico lends additional color to the suspicion that the dispatches from that country have been issued for a purpose to a more or less extent. Manifestly the daily press has been too much occupied lately to attend to Mexico. Consider that during the last two months there have been such weighty affairs as

The Baseball Championship.
The Trial of Lieut. Becker.
The Shooting of Mr. Roosevelt.
The Turco-Bulgarian War.
The Presidential Election.

and what room has there been for Mexico? The last time it was in our mind we were on tenterhooks respecting Felix Diaz. Would he be shot, or wouldn't he? We are still in ignorance, the daily press not having taken the trouble to inform us. We wonder if it is true that Mexico is gradually and quietly straightening out its troubled affairs? Anyway, it is reported from Sonora that the dispersing of the rebels and bandits in that state has created an outlook for the mining industry that is more favorable than for many months heretofore.

The prospect of the new congress being called in special sesion for the specific purpose of revising the tariff makes the terms of the Underwood bill introduced in the second session of the 62d congress of especial interest as an indication of what may be expected from the Democratic control. Mr. Underwood proposed to tax steel ingots, blooms and slabs, at 10% *ad valorem;* aluminum at 25%; antimony and antimony ore at 10%; lead bearing ore at 25% upon the lead contained therein; lead in pigs, bars and base bullion at 25%; nickel and nickel oxide at 10%; quicksilver at 10%; zinc (in blocks or pigs), zinc dust and sheet zinc, 15%. The free list was to comprise iron ore, manganiferous iron ore, pyrites cinder, tungsten ore and zinc ore.

By the Way

A Johannesburg dispatch announces the finding, in the Premier mine, of a 1649-carat diamond, the second largest ever discovered. The new stone, according to the dispatch, is more than half the size of the Cullinan diamond, which came from the same mine, and has black streaks, but experts consider them to be only surface flaws.

A truth which is not generally recognized is that a large part of the European production of radio-active mineral originates in the San Juan district of Colorado, and is shipped from Placerville, San Miguel County. An engineer who is familiar with the details of the subject states that in his opinion this district will ultimately become more famous for its production of radium, uranium and vanadium than for its output of gold and silver.

Seven coal-mining companies in the Kanawha coal field in West Virginia have filed suits, asking damages aggregating $750,000 in the Federal Court for the Southern district of West Virginia against nonresident officers of the United Mine Workers of America, and in the Circuit Court of Kanawha County against local officers of the miners' union. The plaintiffs charge unlawful interference with the operation of their mines during the recent strike, intimidation of miners and destruction of property.

Sir William Ramsay has said in interview with the Boston *American*: "Every factory which has anything to do with manufacture of copper or treatment of copper is producing selenium and tellurium as a byproduct. Nobody knows what can be done with them. Here is a chance for some bright young American students to go to work with patience and determine to solve the problems of the identity and properties of these two substances. There may be a fortune for somebody in this one field of research." And then again, it may be the company that will get the fortune.

In commenting on the market for Comstocks, the San Francisco *Chronicle*, of Nov. 1, says: "After whipping Sierra Nevada up and down for several days on the strength of a reported orebody, the Bush-street manipulators laid violent hands on poor old Con. Virginia yesterday and forced the decrepit to produce a "strike," which struck very deeply into the imaginations of the paranoiacs who revel in that sort of thing. The stocks advanced to 42c. bid at the close, which is nearly the sum of the last two assessments."

The Eastern Texas Brown Ore Co. has advanced so far in the development of its mines, that the ore is to be offered to furnaces for delivery early next year. The ore is a brown hematite, which runs about 52 per cent. in iron natural and around 0.09 per cent. in phosphorus with a trace of sulphur. The new railroad line which will give this ore an outlet to the Gulf of Mexico at Port Bolivar is completed and the mining equipment and plant are being installed. Steamship arrangements for transporting the ore to the eastern Pennsylvania seaboard have been practically made.

High finance in public-service corporations in New York has lost its glamour. Here is the Public Service Commission refusing permission to the New York Railways Co. to issue bonds for 175 new cars to displace the same number of old ones. The commission held that the old cars having been already charged to capital account, only the difference between the first cost of the new and of the old cars should be funded. What is the opportunity for a Napoleon of finance under such restraint? The New York Railways Co. has nothing to do with the mining industry, but there are many mining and metallurgical companies that do just what it used to do and delude their stockholders in the same way.

The holidays in Mexico and South American countries are recognized by all long-suffering mine managers as an unmitigated nuisance. The same feeling is more and more coming to be held in the anthracite coal field of Pennsylvania. In one week recently more than half the time was lost. These holidays are filled with hilarity and boisterousness stimulated by the drinks, which are never absent. On this account a single holiday may mean two days away from work. The situation regarding miners' holidays was described to the *Wall St. Journal* by a man on the ground, as follows: "The past week the miners celebrated Mitchell Day on Tuesday, All Saints' Day on Friday, All Souls' Day on Saturday, but endured All Hell's Day on Sunday."

An engineer requested advice respecting procedure in a case where he had reason to believe that his client would fail to pay him the balance due upon a mining report when that report should be delivered, and asked if it be customary among engineers, and in conformity with professional ethics, to send such a report through a bank with draft attached. There is nothing unprofessional in the suggested procedure, so far as we can see, but it is not common. The business of a mining engineer, like all other business, rests in the main upon credit and confidence. The transmittal of a report through a bank with draft attached implies, of course, that the engineer has no confidence in the integrity of his client, and resenting this the client might refuse to accept the report unless it were a necessity to him. However, every engineer probably will recollect regretfully some occasion in his experience when he ought to have done just this thing.

"When it is time to go to work the sound of a great bell gives the workmen warning, and when this is heard they run hither and thither through the streets toward the mines. Similarly, the same sound of the bell warns the foreman that a shift has just been finished; therefore as soon as he hears it, he stamps on the woodwork of the shaft and signals the workmen to come out. Thereupon, the nearest, as soon as they hear the signal, strike the rocks with their hammers, and the sound reaches those who are furthest away. Moreover, the lamps show that the shift has come to an end when the oil becomes almost consumed and fails them. The laborers do not work on Saturdays, but buy those things which are necessary to life, nor do they usually work on Sundays or annual festivals, but on these occasions devote the shift to holy things. However, the workmen do not rest if necessity demands their labor; for sometimes a rush of water compels them to work, sometimes an impending fall, and at such times it is not considered irreligious to work on holidays." *Agricola* (Hoover trans.) This raises the question whether the old Germans, and even the Mexicans and Peruvians of today, were not wiser than we are. There are other things than dividends.

The best arranged schemes of mining men aft gang aglee, and sometimes very unexpectedly. A mine superintendent on the Rand tells the following story against himself. He was managing a deep mine working under a special permit from the government, with only one shaft instead of two, and in consequence of certain complaints as to ventilation and the frequency of "air blasts," there was to be a special inspection by the government mining engineer and the president of the mining corporation was to accompany him also. They do not believe in surprise visits in Johannesburg, and due notice of the visit was given. In truth, things were a little bit uncomfortable below and the miners were spending most of their time in a somewhat hot and smoky atmosphere, dodging flying pieces from exploding pillars or slabs that "walked out" to meet them from the faces. The manager thought it advisable to dress the show a little and stopped doing any blasting for 48 hr. before the visit, while the small ventilating fan did double time at 100% overload, so that the mine should be cool and the air clear and the faces quiet. He forgot the laws of expansion and contraction, however, and the result of cooling down things too much was that the party was met by a fusillade of small rock from drifts and faces, and the visitors had a nerve-trying experience. It is not related how our friend made his excuses and explanations; but he was apparently successful as the mine is working today under better conditions.

New Lake Ore Dock

A new ore dock is about to be constructed at Superior, Wis., and bids for the work will soon be opened at St. Paul, Minn., by the chief engineer of the Northern Pacific Ry. The dock will be situated on land owned by the railway between the Reiss docks and the Nemadji River. The slip is now being dredged by the Great Lakes Dredge & Dock Co. While the size of the dock will not be as great as some others recently built, the dock itself will be fully modern in every way. Concrete-and-steel construction will be employed, and the dock will be 1300 ft. long, 70 ft. wide and 80 ft. high, with a pocket capacity of 60,000 tons of ore. The American Bridge Co. has the contract for the steel construction and the dock will be electrically operated.

The building of this dock is an interesting outcome of recent Cuyuna Range developments, marking in a practical manner, recognition of the present worth and future possibilities of this newest of the Lake Superior iron ranges. The Northern Pacific Ry. once owned a great amount of the land that in the last few years has been shown to contain valuable iron deposits. The Minneapolis, St. Paul & Sault Ste. Marie Ry., however, and not the Northern Pacific, aided materially in the development of the range by constructing, at much expense, a new line of considerable length into the new range. It has only been within the last three years that the Northern Pacific Ry., the pioneer in the region, has interested itself in the tonnage possibilities of the range to any extent, and the culmination of its activity is the building of the dock at Superior. The main line of the Northern Pacific Ry., built many years ago, runs through the heart of the range.

Metric Carat Adopted in the United States

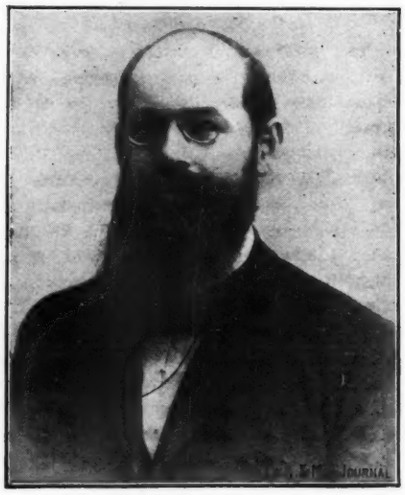
The metric carat of 200 mg. was adopted on Oct. 28, 1912, by representatives of the largest jewelry firms in New York. This is about 2½% lighter than the carat heretofore used in the United States, which has been 205.285 mg. The weight of the carat abroad has varied from that of 188.5 mg. at Bologna, to 213.3 at Turin. The English standard is 205.304, while former Dutch standards were 205.128 and 205.-712. However, the metric carat is now the chief standard in France and the Low Countries. The new measure will go into use on July 1, 1913, and the U. S. Treasury will be asked to use it in assessing valuations. Of 400 votes, only nine were cast against the new weight, which will greatly simplify bookkeeping, weighing for inventory, etc.

Zachary Hochschild

Zachary Hochschild, managing director of the Metallgesellschaft, of Frankfurt-am-Main, Germany, died suddenly at Munich, Nov. 6, at the age of 58 years. This news has come as a great shock to all those interested in the metal business throughout the world, and particularly to the American Metal Co., Ltd., of New York, which is closely affiliated with the Metallgesellschaft, and whose president, B. Hochschild, laments the loss of a brother.

Mr. Hochschild entered the employ of the Metallgesellschaft 40 years ago as a boy, and worked his way up to the leading position in a comparatively short term of years. For many years he has been the moving spirit in the Metallgesellschaft, and that concern in a large measure owes its prominence in the metal trade and industry the world over to his untiring energy, exceptional ability and sterling character.

Mr. Hochschild was well known throughout Europe, and his influence extended



ZACHARY HOCHSCHILD

far beyond his activities within his own concern. His public spirit, compelling personality and high standard of honor were early recognized by the municipality of Frankfurt, which elected him one of the justices of its Commerce Court, in which position he was frequently called upon to act as arbitrator in the most important cases. In recognition of his public-spirited work, the Royal Prussian Government a few years ago honored him with the title of Kommerzienrat. The business world in Germany has lost in him one of its most able representatives. In spite of the many commercial duties which he had assumed, he always found time to devote himself actively to the furthering of charitable institutions, and particularly to the poor of Frankfurt, who have lost in him one of their best friends.

Mr. Hochschild frequently visited the United States, Mexico and Canada, and was intimately acquainted with the mining and smelting industry of the North American continent. His premature death is keenly felt, and his memory will be cherished by the many friends whom he had made on this side of the water.

Ontario Mineral Productian

Returns to the Bureau of Mines of Ontario, giving the mineral and metal production for the first nine months of 1912 show: Silver, 22,231,451 oz.; pig iron, 452,021 tons; nickel, 15,907 tons; copper, 8019 tons; gold, 53,488 ob.; cobalt and nickel oxides, 711,180 lb., and cobalt in crude material, 209,899 lb.; iron ore, 37,265 tons; white arsenic, 2,944,104 lb. The articles are arranged in order of their descending value.

The Porcupine mines began to produce during the summer, and the yield of gold in Ontario for the first nine months of 1912 exceeds any other recorded full year. The bulk came from the Hollinger and the Dome mines. Other contributors were the McIntyre and Vipond at Porcupine, the St. Anthony at Sturgeon Lake, the Olympia at Lake of the Woods.

The shipments from the Cobalt district were: 15,408 tons of ore, 7859 tons of concentrates, and $2,239,124 in bullion. South Lorrain produced 616,692 oz., and Gowganda, 449,281 oz.

The Sudbury mines yielded 15,907 tons of nickel and 8019 tons of copper, during the nine months, both being about 25% increases. Another source of nickel is now the Alexo mine on the T. & N. O. Ry., from which ore was shipped to the Mond Nickel Co.'s smeltery at the Victoria mines.

American Institute of Mining Engineers

The second adjourned session of the annual meeting of 1912 was held in the offices of the institute, on Tuesday, Nov. 12, about 30 members being in attendance. Prof. J. W. Richards, in behalf of the committee on the constitution of the institute, introduced a series of amendments to the constitution and by-laws, the purpose of these being to improve the administration of the institute, especially by abolishing the present dual system of government. The committee proposes to abolish the council and enlarge the board of directors. Another important feature of the proposed amendments is the introduction of the letter-ballot system.

The series of amendments previously introduced by Messrs. C. R. Corning and George C. Stone are still before the institute, but it is possible that they will be withdrawn.

After some discussion of matters involved in the remodeling of the constitution and by-laws of the institute, the meeting was adjourned *sine die*, the annual meeting of 1912 being thus closed.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Food Supply of Miners

With some experience in earlier years in providing for small mining camps and in later years in the subsistence of our army, I have been interested in the JOURNAL articles on the food problem, especially so as your correspondent in the issue of Sept. 28, 1912, has quoted the present army ration.

The changes made in the army ration during the last 10 years have been more and more to relieve the deadly monotony of the food articles and the even deadlier effect of inferior cooking. That the army ration has always been more than sufficient in quantities has not been questioned. Ten years ago, most of the articles for issue to the troops were compulsory, and savings (money value) were allowed to the men only on a few articles and a certain percentage of the component or principal ones. Later, savings were allowed on a portion of all of the articles of the ration. At present no issues are made of the ration, but the value of certain articles, as per accompanying table, is computed each month and the money value credited to the organization. Purchases may be made against this credit of whatever articles of the ration and a long list of what are called "sales articles" that the men desire. Any balance due on this credit is paid in cash at the end of the month, and is expended for food articles that are not carried by the commissary. This plan is feasible only when markets are available and camps are more or less of a fixture. In isolated movements or when transportation is uncertain, the commanding officer directs what articles should be taken by the troops, which would be the principal components of the ration. But the regular ration leaves a surplus.

CALCULATION OF RATION EQUIVALENTS

.....*Garrison*.....*Ration*....

Month.....191..

No. rations	Articles	In bulk	Price	Amount
70	Beef, fresh	Meat component		
30	Bacon, issue			
100	Flour, issue			
100	Baking powder			
50	Beans	Cean Component		
50	Rice			
70	Potatoes, fresh	Fresh veg'e component.		
20	Onions, fresh			
10	Tomatoes, en'd			
30	Prunes	Fruit component		
50	Jam			
10	Apples, Evap.			
10	Peaches, Evap.			
100	Coffee, R & G			
100	Sugar			
100	Milk, Evap.			
50	Vinegar	Vinegar component		
50	Pickles, cuc.			
100	Salt			
100	Pepper, bl'k.			
100	Cinnamon			
100	Lard			
100	Butter			
100	Sirup			
100	Flav. ext. Lem.			

Cost of one ration averages at present about 24c.

The Subsistence Department has schools for bakers and cooks at several points, and men are being constantly detailed to take a course of instruction. Extra-duty pay and increases of pay are added as an inducement to study and perfect the culinary art. Company commanders are more and more interesting themselves in the way the food is served to the men, and the result is—better cooking—less waste—and more contentment.

Other points to be considered in considering food supply for miners are that soldiers have more idle time on their hands, do not perform such laborious work as miners, consequently do not require so much staple food, but have a greater desire for luxuries. Hard work and cold weather mean that more food is required and abundant food should be on the miners' table to meet this demand.

The army ration in staple lines is not sufficient for mining camps, while the means at the command of the government allow of a greater diversity of food articles and, as regards storage and transportation, ways and means are not considered as they must be by a private firm.

Summing up: The chief requisite is a good cook. He will save more than the extra cost. Give him his price. In Australia, on the large sheep ranches, the men who are working at piecework in shearing time, pay the cook so much per head per week. The price is a liberal one and the cook one of the best paid men—but he must have the goods.

H. GRAY.

Oakland, Calif., Oct. 17, 1912.

Lead Salts in Cyanide Treatment

I have been much interested in the article on the above subject, by J. E. Clennell, in the JOURNAL of Sept. 28, 1912. There are several points, however, upon which additional data would be of assistance in throwing light upon the subject. The statement is made that the experiments were carried out with mill solution, except when otherwise stated, and a sample of "Mexican silver ore containing silver mainly as sulphide, and ground so that over 99% passes a 200-mesh screen." It seems to me that this is not sufficient information upon which to base conclusions. The character of the ore experimented upon should have been clearly stated, and its contents, aside from silver and gold, explained, so that it would be possible to arrive at conclusions as to the possible effect of the lead salts upon similar or dissimilar ores. The content in silver and gold, also, would be of assistance to anyone wishing to study the matter, as it might have a certain bearing on the subject.

Mr. Clennell believes that soluble sulphides can seldom, if ever, be detected in solution, even without the addition of lead salts, and that they are likely to be immediately converted into thiocyanates or precipitated by the zinc in solution. My own observation corroborates this belief, but there are some cases where, in the absence of lead salts, a large amount of free sulphur exists mechanically suspended in the solution. This sulphur will resist efforts to settle or filter it and has an appreciable effect upon extractions.

The subject is of interest and it is to be hoped that Mr. Clennell will supplement his article with another explaining fully the nature and grade of the ore and solution upon which he experienced.

VIAJERO.

Denver, Colo., Nov. 1, 1912.

College Men in Underground Operations

As economic underground operations continue to involve more and more the principles of scientific management, the question of what class of men is best fitted to direct these operations seems to become more and more important. At most of the larger mines the men eligible for the more important positions, are, in general, of two classes: "Old timers" or practical men and the college men with a good education and more or less practical experience, the former naturally far outnumbering the latter. Between these two classes a choice must inevitably be made, by the larger mining companies at least, as to which shall fill these before-mentioned more authoritative positions.

It is frequently said by college men after having underground experience that they "learned more about mining in their first year out of college than they did in all their four years in college." This may be perfectly true and it is believed that most college men will admit it, but it is probably the training they received during their college years that fitted

them to learn faster and better when later they actually "got their nose in the muck." Any reasonable man will also admit that a college course, if taken seriously, trains any man to be systematic, and in uptodate mining this is, of course, a fundamental principle, no matter what position a man may occupy. An "old timer" may be systematic (most of them are very much so) but it takes him longer to learn than it does a college man, and if conditions change and it is necessary to learn a new system or adopt new methods, there is hardly any comparison to be made between these two classes as the difference is so great. In other words, an "old timer" adopts a system merely because it is easier for him to work by rule of thumb; but a college man sees the reason for it and is, therefore, quicker to see how improvements can be made by a change of system.

At the larger mines in the United States where accurate costs of all underground operations are kept, it is difficult for the average "old timer" or practical man to understand or realize the importance of such terms as: "Cost per ton powder," "development cost per foot labor," "tons per man per day," etc. An understanding and realization of the importance of such terms and methods of cost keeping of course enable the operating men to know what the different classes of work and supplies are costing in their different working places, and such knowledge makes it possible for them to make comparisons and to reason out the source of leaks, making their work more efficient accordingly. A lack of knowledge concerning how these figures are arrived at and what they amount to means that such a man might very easily overlook an important leak or a wasteful expense for a long time before he knew what was really the matter. Of course, many companies do not make a practice of allowing their operating men to know the cost details of their work, but it is, however, common practice at the better managed mines to let the operating men know approximately what they are doing in this respect and to govern their work accordingly.

The attitude which "old timers" take toward such methods is well illustrated by a remark heard recently from an old practical man who has spent many years underground. "Figuring may be all right but you can't put ore in the skip with a pencil." As has been said, it is, as a rule, hard for the "old timer" to understand the truth and importance of figures, whereas the technical or college man has been trained in that direction and it should come natural to him.

A college man can learn much from a practical man and the knowledge he acquires from such sources and from experience will gradually develop him into what might be termed a "practical technical man" which is indeed the happy combination of the two. On the other hand it is difficult for an "old timer" to learn anything from a college man and it is, therefore, almost impossible for him ever to understand more than the most elementary technicalities. It goes without saying that there are many exceptions to this statement, some of which are noteworthy in many respects; but as a general rule this condition of affairs is believed to be true.

The ability to handle men is largely a temperamental gift and is as likely to be found in the college man as in the practical man. However, one of the secrets of this ability is to know what a fair day's work is, and probably most mining men will agree that this knowledge is to be gained in no other way than from practical experience. A college man who has never been on the business end of a "muck stick" himself or who has never done his trick at the crank of a machine is certainly in no position to dictate how many cars a mucker should muck or how many holes or feet is a good shift's work for a drill runner. There is nothing more ridiculous on the face of the earth or more properly, under it, than a green college man giving orders and laying out work which he has never done himself.

In such cases a college man will probably demand an unreasonable amount of work from one man and lay out something so absurdly easy and simple for another that the first will generally be justly disgusted and not do so well as he otherwise would and the second will, in nine cases out of 10, "throw a bluff" and "taper" most of the shift. In neither case is the man working efficiently. Therefore it is believed that the best thing a recent technical graduate can do, who intends to follow the operating end of mining, is to subject himself to a year or two years good stiff grind as mucker, machine man, timberman and under-boss of some sort provided he has luck enough to get such jobs and sand enough to hold them. Furthermore, a college man who has not done such work cannot be of much use in the underground operating department of any good mining company.

Another point in favor of long practical experience is the sound judgment it gives, which is required in cases of bad ground, the weight of heavy or moving ground on timbers, the drilling and breaking qualities of different formations and many similar details. The "old timer" can be relied upon to be almost correct in his opinions of such things and although some of the questions which come up in such circumstances are really no more than guesses, the "old timer's" guess is far more apt to be right than any college man's.

A practical man with no college education will work, as a rule, for less wages for a longer time than a man who has been technically educated. The college man calculates that his years of training in a scientific school entitle him to better pay than that received by the "old timer" and he will generally consider himself worth more to the company whether he is or not. As a rule, the "old timer" is more faithful to his employers than the average college man is apt to be and is generally more satisfied with his work, for the reason that a college man looks for rapid advancement while the "old timer," as long as he receives fair wages, is satisfied. Most mining men realize and appreciate the fine loyalty and pride which nearly all "old timers" show and feel for the company which employs them and doubtless most of us can call to mind not a few examples of the fine old men who have spent the best years of their lives in the interest and service of their employers and whose faithful efforts have contributed not a little to the success of mining companies, large and small, throughout the mining countries of the world.

The main points in the foregoing paragraphs may be summarized as follows: (1) The ability of college men to learn fast, to be systematic, to reason clearly and to adapt themselves and their work to changing conditions. (2) The ability of college men to calculate and realize the importance of figures. (3) The possibility of a college man's developing himself into a "practical technical man." (4) The lack of ability in a college man to direct work for others which he has never done himself. (5) The better judgment of the "old timer" in details which can be gained only from long experience. (6) The superior faithfulness of the "old timer" to his employers.

In conclusion it may be said that whether a man is a college graduate or not, the fact remains that the ideal operating man for the efficient mining of today is the one who has good sound common sense, good practical experience, and education and brains enough to handle the technical problems which come before him. Such a man may either be a college man who has gained his technical knowledge in some good scientific school and, to learn the other side of it, has had sense enough to humble himself to a period of good stiff underground labor, or, he may be a practical man who has educated himself sufficiently and who, through hard work and study, has developed into the ideal combination. Statistics would probably show that cases of the former kind are more numerous than the latter and, in view of the economic conditions required in underground operations today, it is therefore believed that the college man is destined to be given the preference.

THEODORE V. K. SWIFT,
Mine Captain.
Mineville, N. Y., October 31, 1912.

Decision in Slime Filter Case

As announced in a previous issue, the Moore Filter Co. was awarded the decision in its case (No. 1612) against the Tonopah-Belmont Development Co., in which it was claimed that the Butters filter used by the defendants infringed the Moore patent (U. S. pat. No. 764,486, July 5, 1904). This decision was given at the October term of the U. S. Circuit Court of Appeals for the Third Circuit, at Philadelphia, Penn., Judges Gray, Buffington and McPherson sitting. It reverses the decision of the U. S. District Court given at Trenton, N. J., in February of this year.

The decision in the appealed case to decide whether the Butters filter infringed the Moore patent was awarded the Moore company. The opinion of the court declares that evidence showed that Moore was the first to solve the slime problem; that his claims for a process of slime filtration were valid; that the Butters filter used the Moore process.

Two Questions to Answer

In his opinion, Judge Buffington states: "As applied in the present case, the patent concerns the process of filtering metal-bearing slimes and is known as the Moore process. The respondent's filter is for the filtration of like slimes and embodies the Butters process. Both processes utilize the cyanide-ore treatment and the question before us is twofold: (1) Does Moore's process involve invention? and (2) does the respondent's Butters filter make use of the Moore process?"

Judge Buffington then outlines the early history of the cyanide process pointing out, by excerpts from articles published in technical journals in 1892 and thereafter, the great hindrance offered by slime to the successful application of the process when leaching and decantation methods alone were practiced.

The following excerpts from the opinion indicate the course of reasoning followed in reaching the decision: "The first suggestion for the solution of this world-wide problem is found in the ENGINEERING AND MINING JOURNAL, Dec. 5, 1903, being a communication from George Moore, wherein he described the process for which the patent in suit was issued to him the year following."

"After a careful study of Moore's patent, we have reached the conclusion that his process is a radical departure from the whole prior art and was an original and pioneer step in metal recovery by filtration. . . . its novelty consists in his utilizing the simple elemental processes of nature. These processes he has, of course, neither discovered nor invented, but he has utilized them in combination in a manner never before used and has thereby secured a new result."

"The creation of this uniform and even resistance in the cake is the gist of Moore's process and such uniformity . . . . is secured by the slime being submerged when subjected to suction."

"It is contended, however, that the Moore patent is invalid by reason of the disclosures of the prior art. But in our view this contention is based on a failure to recognize the true significance of what Moore really did. Practically his problem was to make commercially possible the recovery of a minute amount of valuable metal from a large quantity of mud. Of the fact of the metal being there, there was no doubt, for that fact, and indeed that it was possible to extract it, the tedious and costly method of laboratory filtration showed. It suffices to say that no one of the numerous patents cited did such work, used such process, or effected such results, and if none of them led their inventors or users to the use of any process whereby such work could be done, or even led to a suggestion in their descriptive matter of the possibility of the use of any such process as Moore's, it follows they taught Moore no more than others.

Moore's Process and Not His Apparatus Involved

"So far as the patent here in question is involved, Moore's disclosure was the process he originated and not the machine with which he illustrated the use of his process in accordance with the statutory requirement that he file a written description 'of the manner and process of using it.' To find, therefore, here and there in prior patents, and disassociated from each other, all the mechanical appliances of the combination apparatus which Moore thus illustratively used is not to prove that Moore's process is not original.

"Viewed from a patent standpoint, the significance of a machine lies not in its form but in the principle on which it works, as will be seen in the requirements of 4888, 'in the case of a machine, he shall explain the principle thereof.' It suffices therefore to say that very few of these patents are even for a process, and as none of them operated on the principle or process of Moore, they cannot be held to forestall or minimize the originality of Moore's subsequent disclosure.

"And in giving these patents their due relation to Moore's disclosure the fact must not be overlooked that the slime problem which Moore solved only came into existence from the use of the cyanide process, which began, as we have seen, about 1887. It will therefore be manifest that no patents preceding that date and none subsequent thereto which did not apply to the cyanide process, were calculated to solve the cyanide percolating difficulties that arose in the use of that process.

Prior Laboratory Practice Does Not Affect Validity

"So, also, to say that following prior laboratory practice, it was possible to leach and extract the unrecovered ore left in a pasty mass by the cyanide process is not to destroy Moore's patent; for this is to lose sight of the practical working value of Moore's process as a workable, economic treatment, as compared with theoretical possibility of laboratory practice. By repeated dilution the laboratory could and we will assume did recover with practical completeness all such unrecovered metal, but this has been done with an expenditure of time, labor and expense out of all proportion to the value of the metal.

"When, therefore, Moore disclosed a process by which such recovery was made enormously profitable and by which he turned a dump heap which under all known processes, machines and laboratory methods was worthless into profitable ore, we are constrained to give little weight to the suggestion that his process was either anticipated, a mere advance incident to the art, or involved no invention.

"So, also, it is said that the step described in his claim, viz: 'further impoverishing the solids by a cleansing operation,' was merely the washing or dilution of the prior art. Considered in its literalism and in isolation, such contention may seem plausible but considered as a step in Moore's process it takes on new significance and value. Bearing in mind that in the prior steps of the process covered by this claim, the completely submerged filtering medium has formed a cake of uniform resistance at all points and by reason of such uniformity the solvent has percolated and is permeating the cake, it follows that the step which follows is a nondiluting and bodily displacement of the solvent and not a diluting intermingling.

"This displacement in contrast with dilution, not only saves the time and expense of repeated dilution and refilling, but also obviates excessive dilution of the solvent solution and the necessity of rehandling large volumes of diluted solutions in the recovery of the metal. It seems, therefore, that the 'further im-

poverishing the solids by a cleansing operation' of Moore's process, owing to the prior step whereby a cake of even and uniform resistance is secured by submergence, is not a mere washing or diluting step, but is one wherein there is exerted a uniform pressure or pushing action through the entire cake surface, thereby in effect advancing a wall of water pressure to force ahead of it from the cake the value-bearing solvent liquid and leave in the cake an equal volume of nonvalue-bearing water. This final result is secured by first having built up a cake of uniform resistance to solvent fluid flow, and secondly by again submerging the filtering medium and its built-up cake in the nonvalue-bearing displacing fluid. By this displacement by pressure difference only Moore pushes ahead instead of washes through the cake-contained, metal-carrying fluid.

"As showing the practically complete metal extraction by the Moore process, we restrict ourselves to the uncontradicted testimony of results at a South Dakota mine, where the original slime contained gold at the rate of $7.90 per ton of dry slime. After filtration alone the cake still contained $2.75 per ton of dry slime. After being then subjected to the displacement step there was left in the cake but four cents of gold per ton of dry slime.

Moore Patent Considered Valid

"Being of opinion, therefore, that Moore's process was novel, useful and inventive in character, his patent is valid and we next turn to the question of infringement.

"As claims four and five furnish sufficient basis for deciding that question, so far as the respondent's device is concerned, and as some questions, not necessary to be here decided, exist as to claim 10, we restrict ourselves to a consideration of claims four and five. In considering the question of the infringement of a process patent, it must be borne in mind that the monopoly secured by the claims is, generally speaking, a monopoly of the process and the test of infringement, is whether such process is utilized by the infringer.

"As the apparatus shown in a process patent is only to show that the process may be practically applied, it follows that such illustrative apparatus does not limit the process patentee to that type of machine alone. If that were the case a process patent would be of little value. So distinctively and separate in the patent law are process and apparatus for utilizing such process that where, after a patent for a process by one inventor a second inventor might patent a novel apparatus for utilizing the process, the situation would arise that the inventor of the process could not employ his process in such machine without license from the machine patentee and the latter could not use the process in his machine without license from the process patentee.

Details of Apparatus Immaterial If Filtering Principle is Identical

"It will therefore be evident that the test of process infringement is not the similarity of apparatus, but rather whether the apparatus, no matter what its form, utilizes the process. Tested by this standard it is clear to us the respondent's device infringes. In form the particular apparatus shown in Moore's patent and the apparatus of respondent vary in the number of tanks, in the differences between changing the fluid which envelops the filtering medium, as in respondent's device by allowing the filtering medium to remain stationary in one tank while the submerging fluid is first drawn off and the second submerging bath is then drawn into the same tank, while in Moore's the filtering medium is raised from the submerging bath in the first tank and then lowered into the second submerging bath in a second tank.

"But this difference in numbers of tanks and of respective withdrawal and replacing of different baths in no way affects the identity of the process, for it is manifest that Moore could in his patent specification have shown the use of his process, just as well by using respondent's apparatus, had he known of it, as his own. Both alike use the principle of submergence and intra-leaf suction to create the uniform and even resistance of the cake and both alike use the principle of intra-leaf pressure, Moore using air and the respondent water, to shed the uniformly resisting cake from the filter.

"For the mere fact of the output being carried off as a dry product in Moore's case to a dump heap and in respondent's in fluid form to a slime pit, does not go to the substance of the process. In the essentials that involve the invention the two are alike. Had an apparatus such as respondent's, operated as it is, been in use prior to Moore's there would have been no invention either in the process or in the apparatus shown in Moore's patent. And what, if preceding a patent, would have anticipated it, equally infringes if subsequent. We therefore hold the fourth claim is infringed.

"As we are of opinion and so find from the proofs that there is in respondent's device a 'removing the medium while continuing the drawing action,' the fifth claim is also infringed.

"The decree of the court below is therefore reversed and the cause remitted with instructions to enter a decree adjudging claims four and five valid and infringed and for such action by that court in the way of injunction and accounting as it shall deem fitting."

Defendant's View of Filter Decision

In response to our request for a statement concerning the decision of the U. S. Circuit Court of Appeals in the suit, Moore Filter Co. vs. Tonopah-Belmont Development Co., the Butters company has sent us, with permission to publish, a copy of a letter received from its attorney, Harold Binney. This communication is given below in full:

New York, Nov. 11, 1912.

To the Butters Patent Vacuum Filter Co., Inc.,
50 Church St., New York.

Gentlemen:

Please find inclosed a copy of the opinion written by Judge Buffington as the opinion of the United States Circuit Court of Appeals for the Third Circuit in the suit Moore Filter Co. against Tonopah-Belmont Development Co., overruling Judge Rellstab's decision in the lower court, and holding the Moore process patent valid and infringed. The decision that Moore's apparatus patent is not infringed remains in force.

My colleague, Mr. Kenyon, agrees with me that the serious errors of fact on which the opinion rests will be so obvious to all mining and metallurgical engineers that a modification of the opinion by rehearing is (so far as it might form a persuasive precedent in other courts) quite unnecessary. As, moreover, the decision is binding as a legal precedent only upon the courts of New Jersey, Pennsylvania and Delaware, which form the Third Circuit, and as it is still subject to review by the Supreme Court of the United States by certiorari it should not give any alarm to licensed users of the Butters patent filters or processes anywhere else.

I strongly urge you to consider the advisability of publishing the two opinions together, thus letting public opinion throughout the world be formed upon full information of the reasoning of the two courts. The carefully studied opinion of Judge Rellstab, based on arguments that were not cut short by time limits, will speak for itself to those skilled in the art.

The other pending suit upon the Butters patents against the Moore Filter Co. is not affected by the present decision, but as the Moore Filter Co. has refused to admit its own responsibility for the use of the Butters acid wash and of reduced vacuum while the filter is exposed to the air, I strongly advise you to immediately sue the infringing users themselves.

(Signed) Harold Binney.

Ocher is defined as a hydrated ferric oxide permeating a clay base. Its most extensive use, according to the Geological Survey, is as a filler in the manufacture of linoleum.

Oxygen Efficiency of the Pyritic Furnace

BY GEORGE A. GUESS*

I have claimed that the gases from a pyritic furnace always contain considerable free oxygen; that the oxygen efficiency of a pyritic furnace will vary from 50 to 80%. In the days when the furnaces of the Tennessee Copper Co. were individually connected to the blowing engines in the power house, I made many of these calculations, starting from the piston-blowing engines, the efficiency of which we knew, making the calculations on a month's run. When the acid plant was put into commission, a slight back pressure was put on the furnace tops, so that no false air was admitted, and the furnace gases always showed considerable free oxygen. The average of the analyses for a month, checked with calculations based on air delivered. I have many times marvelled at Sticht's published analyses of his furnace gases taken from near the furnace focus, which have been widely accepted. These analyses show practically no oxygen.

Some years ago, while chief chemist for the Greene Cananea Copper Co., I drew gas samples from a reverberatory-furnace flue, and found no oxygen. It had all been absorbed in the metallic tube through which the sample was drawn. This question of gas analysis has just been opened again for me by a study of Vol. III of Richards' "Metallurgical Calculations." In this volume, Richards takes data that various metallurgists have published and makes most interesting problems from them. On p. 471, problem 106 deals with the average of five analyses, by Sticht. Calculating from these, and taking the formula of the sulphide as FeS, Richards can account for barely two-thirds of the oxygen, which must have accompanied the nitrogen, which is 87.66% of the gas by volume. He says the sulphide must therefore be Fe_2S (?) and not FeS, "for otherwise the gas analyses would show impossible conditions." His calculation, based on the assumption of Fe_2S, however, still shows a shortage of oxygen, accounting for only 20.24 volumes out of a necessary 23 volumes. Calculation on the basis of FeS gives the oxygen efficiency as 67%, instead of 94%, as shown by Sticht's figures.

I am well aware that many men realize that about 70% is common practice for the oxygen efficiency in pyritic smelting, but the published analyses of the gases from Mount Lyell and the frequent statements based on these analyses that pyritic furnace gases contain no free oxygen have been the cause of a great many misconceptions. With this in mind, no doubt Professor Richards, in problem 105, based on Freeland's published article on pyritic smelting in the ENGINEERING AND MINING JOURNAL, assumes that there is no free oxygen in the furnace gases. He works out on this basis the efficiency of Freeland's blower as 32.8% of the rated capacity, as stated in the article. An old rotary blower often has a low efficiency, but no one would conceive of Freeland's running a blower whose efficiency was only 32.8%. The trouble is in the assumption of 100% oxygen efficiency in the pyritic furnace.

Richards, in calculating further in problem 106, from Sticht's gas analysis, finds that 960 cu.m. of air are used for each metric ton of slag made or practically 1¼ tons of air to one ton of slag, which ratio appears absurd.

I say that Sticht's analyses of pyritic-furnace gases are incorrect; that calculations based on them lead to absurdities; it is impossible to obtain a gas containing 87% nitrogen either by calculation or experiment where FeO is produced from iron sulphide; and that the continued reference in textbooks used in our metallurgical schools to such a condition as essential to pyritic smelting is an error that should be more widely recognized.

*Professor of mining and metallurgy, University of Toronto, Toronto.

California Oil in September

The September production of petroleum in California fields exceeded all other months. The largest increases were in Midway and Fullerton fields. Kern River and Coalinga fields decreased. The net production in September was 7,222,185 bbl., an increase over August of 51,196. Daily average production in September (30 days), was 240,739 bbl., an increase over August (31 days) of 9417.

PRODUCTION BY FIELDS

District	Bbl.
Fresno County—	
Coalinga	1,540,646
Kern County—	
Midway	2,189,748
Kern River	864,864
McKittrick-Beldridge	521,844
Maricopa	510,033
Lost Hills	115,981
Total Kern County	4,202,470
Santa Barbara County—	
Santa Maria, Lompoc, Cat Cañon	437,422
Summerland	4,250
Total Santa Barbara County	441,672
Southern Fields—	
Fullerton (Olinda, Brea, Puente)	513,384
Salt Lake-Sherman	221,911
Coyote-La Habra	146,200
Ventura	57,976
Whittier	56,704
Los Angeles	32,000
Newhall	9,222
Total Southern Fields	1,037,397
Total all Fields	7,222,185

September shipments amounted to 6,400,580 bbl., a decline from August of 284,526. Field consumption in September, 420,299 bbl., a decline from August of 1017. Stocks on hand, Sept. 30, 46,674,172 bbl., an increase over August of 749,222. Field operation and development in September showed 41 new rigs, 58 completed wells, 5789 producing wells active, 735 wells capable of producing, but idle, 366 wells actively drilling, 313 wells on which drilling was suspended, 38 wells being deepened, five wells abandoned.

Nevada Consolidated Copper Co.

The report of the Nevada Consolidated Copper Co. for the quarter ended Sept. 30, 1912, shows a production of 18,405,467 lb. of copper. This is made up as follows: July, 6,246,859 lb.; August, 6,551,030; September, 5,607,578 lb. The falling off in the September production was due partly to treating considerable ore from the Liberty Pit, which, through its hardness, reduced the tonnage per mill section, and partly to unsettled labor conditions in September previous to a strike at the mines.

During the quarter, 797,794 tons of Nevada Consolidated ore, averaging 1.74% Cu, were milled, of which 737,065 tons were from the pits, and 60,729 tons from the Veteran mine. Deep drilling to determine the possible existence of additional ore at the Eureka Pit was begun in September, but the strike forced a suspension of this work. It will be resumed as soon as possible.

The net credit for the quarter to undivided profits amounted to $798,135, after payment of dividends, depreciation on mines and Steptoe Valley smeltery. Owing to good earnings, a reduction in copper in transit, and taking over cash from the subsidiaries, the Steptoe Valley Smelting & Mining Co., and the Nevada Northern Railway Co., the cash on hand now stands at $1,303,191, and it is stated that if financial conditions are as good at the next dividend date as they are now, an extra dividend will be declared.

The report, dated Oct. 30, 1912, states that the strike above referred to was purely for recognition of the Western Federation of Miners. Operations ceased at the mines on Oct. 2, were resumed on Oct. 24, and at the date of the report, the mines were running at 50% capacity.

Utah Copper Co.

The report of the Utah Copper Co. for the third quarter of 1912 shows a total production of 29,966,920 lb.; July, 11,160,614 lb.; August, 11,841,162 lb.; and September, 6,965,144 lb. During the quarter there were 1,581,521 tons of ore milled, as compared with 1,503,884 tons in the preceding quarter, when the production was 28,372,038 lb. of copper. The average assay of the ore milled was 1.41% of copper, as compared with 1.42% in the previous quarter.

The average cost per pound of net copper produced, after allowing for smeltery deductions and without crediting mis-

cellaneous income, is given at 7.707c., as compared with 8.127c. during the second quarter. If the net miscellaneous earnings in Utah, including those from the Bingham & Garfield Ry., were credited to the cost of operations, the net cost per pound for the quarter would be reduced to 7.017c. Financial results were: Milling profit for quarter, $2,539,584; other income, rents, etc., in Utah, $11,699; income from Nevada Consolidated dividends, $375,187; total net profit, $2,926,470; less dividends paid, $1,182,413; net surplus for quarter, $1,744,057.

During the quarter, a total of 1,408,133 cu.yd. of capping was removed, a decrease of 181,515 cu.yd. from the previous quarter, due to a strike at the mines. This deficiency is also shown in the copper output, as given above. The cause and progress of the strike have been chronicled from time to time in the JOURNAL, so reproduction of the particulars given in the report is unnecessary.

During the quarter, the Magna plant was in full operation until closed by cessation of shipments from the mines, handling 62% of the total tonnage. The thirteenth and last section of the Arthur plant was started early in September, and nothing in the way of construction remains to be done at either mill, excepting the completion of the improvements in the coarse-crushing departments now in progress at both of them, which work is now nearly finished.

The contemplated extension of the Magna steam plant is unnecessary, due to proposed hydro-electric extension in the vicinity of Salt Lake City and on the Bear River, in Utah and Idaho. The Utah Copper Co. will obtain all its power requirements from this source. Operations of the Bingham & Garfield Railway continued satisfactory until the day of the strike, Sept. 18. Up to that time, 13,140 tons of ore per day had been transported, together with 928 tons of other freight.

Chino Copper Co.

The report of the Chino Copper Co., covering the third quarter of 1912, shows a total production in concentrates of 10,340,963 lb. of copper, of which 3,228,703 lb. was produced in July; 3,668,714 in August; and 3,443,546 in September. Production in the first quarter was 3,271,980 lb., and in the second quarter was 4,289,644 lb. There were 340,300 dry tons of ore milled during the quarter, of an average tenor of 2.33%, of which 62% came from the Romero orebody, 29% from the Chino, and 9% from the Hearst.

Milling profits for the quarter are given at $994,274; for the nine months at $1,556,678; miscellaneous income for the quarter, $57,413; for the nine months, $113,225; total profit, quarter, $1,051,687; nine months, $1,669,904.

The cost per pound of net copper, allowing for smelting deductions, and not including miscellaneous income, is stated to be 6.57c. per lb. There is included in this a charge of 30c. per ton, to extinguish mine development and stripping charges. In miscellaneous income is credited $23,382 from the direct shipment of 1125 tons of Hearst ore to a smeltery. The cost per pound of copper was 7c. on this material; the contents 267,515 lb.; which, added to the concentrator production, makes a total of 10,608,478 pounds.

The recovery was 65.15%, compared with 62.96% in the second quarter. The low extraction is still laid to having to treat oxidized ore, and it is stated that in July, on less oxidized ore, a recovery of 74.84% was made. The production of concentrates was 20,665 tons, averaging 25.02% Cu. Concentration was 16.47: 1.

The fourth section of the mill, at Hurley, N. M., was ready for operation in August, but the water-reclaiming system had not been completed, and four sections could not be run continuously until near the close of September. The fifth section should be complete in November, at which time the great construction expenditures will be over.

Plans of California Independent Oil Producers

The increase in the output of petroleum for the month of September in this state and the likelihood that October's production will be greater on account of the recent coming in of several gushers in the Midway field, together with the refusal of the Standard Oil Co. to accept any more crude oil at less than 18%, has thrown operators whose product is of that quality into consternation, says the San Francisco *Chronicle*. It is understood that the greater part of the contracts with the Standard for this low-grade oil will expire next January, after which date there will be no market for it unless some one of the other great marketers—the Associated or the Union—steps in to their relief. So many applications have been made since for membership in the Independent Oil Producers' Agency that the board of directors of that corporation held a meeting at Bakersfield to pass upon the advisability of admitting the outcasts.

The directors of the Independent Oil Producers' Agency, at their meeting, affirmed a resolution adopted last spring against receiving from the individual members more oil each month than is necessary to meet the current sales; placed in the hands of the president, L. P. St. Clair, the authority to prorate the deliveries from the several companies; went on record as opposing the building up of storage as a bad policy for the agency to pursue, even though storage be furnished free; voted to admit to membership the United Development Co., the Oil Exploration Co. and the Miocene Oil Co.; denied a request of E. L. Doheny, of the American Oilfields Co., to withdraw from the agency 240 acres of land in the big gusher district of North Midway and substitute a section of unpatented land in another part of the field, and appointed a committee of five to confer with a like committee from the producers of low-gravity oil, whose contracts the Standard has declined to renew, with a view to devising a plan whereby the latter companies may be taken care of with advantage to both parties. Conferences were to be held by President St. Clair with a committee from the Oil Producers' Protective Association, with a view of making arrangements for the handling of its product by the Independent Agency.

Hollinger Finances

The financial statement of the Hollinger Gold Mines, Ltd., is of especial interest just now, as that company is the first of the Porcupine mines to enter the dividend-paying class. An initial declaration of 3%, payable Nov. 2, has been made, and it is understood that dividends of the same amount will be paid every four weeks, making 39% per year. The figures given in the accompanying statement are provisional, and subject to correction when the smelters' returns are received. The surplus as of Nov. 2 is estimated at approximately $800,000.

HOLLINGER PROVISIONAL BALANCE SHEET AS OF OCT. 26, 1912

Current Assets			
Cash			$33,496
Bullion on hand			27,570
Bullion shipped (not paid for)			89,499
Precipitates on hand			97,500
Gold in mill solutions			24,000
Slags on hand			17,000
Materials and supplies on hand			30,660
Accounts Receivable			7,407
Guarantee Deposits			500
Imperial Bank, Toronto, Reserve for Dividend No. 1			90,000
Insurance paid in advance			2,833
			$420,465
Capital Assets			
Mining properties	$2,500,000		
Development	302,556		
Plant	593,728		3,396,284
			$3,816,749
Current Liabilities			
Wages unpaid			18,254
Salaries unpaid			2,750
Accounts payable			36,973
			$57,977
Capital Liabilities			
Capital stock			3,000,000
Surplus			
Premium on shares sold —invested in plant and development	$250,000		
Profit from operations. Reinvested in plant... $82,432.92			
Reserve— div. No. 1. 90,000.00			
Balance in reserve.... 336,338.89		508,771.81	758,772
			$3,816,749

Lithium is the lightest known solid element and has a specific gravity of 0.585. It is soft, not tenacious and is not known to have any valuable properties.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Foundations for Prospecting Machinery

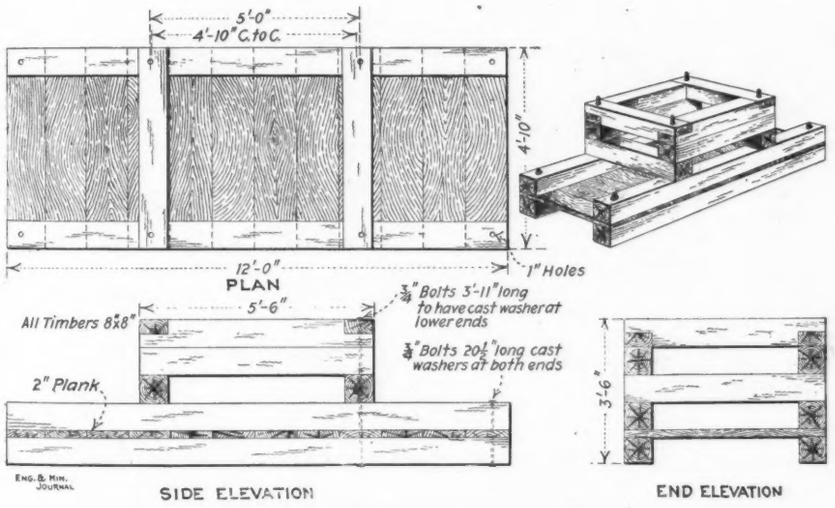
By Horace F. Lunt*

The conditions of operation of the small hoists used for prospecting seldom render it necessary or desirable to construct masonry or concrete foundations. The work is of a temporary character, and in a comparatively short time the hoist will be replaced by a larger one or the work abandoned. What is needed is something that is easy to construct, inexpensive and yet sufficiently strong and solid. Timber foundations are generally used in such cases, but often they are poorly constructed and so unsteady as to permit trouble due to vibration.

Timber foundations are perfectly satisfactory if properly designed, and if they are not intended for use for a longer time than the life of the timbers; this period will, of course, vary with the kind of timber and the conditions under which it is used. The illustrations show a timber foundation designed for a 6x8-in. steam hoist. Its essential feature is the platform between the sills, on which sufficient rock and earth is piled to hold the hoist steady. I have used a foundation of similar design but of heavier (12x12-in.) timbers for a 30-hp. electric hoist with perfectly satisfactory results. I have also employed this design, using round timbers and round poles in place of the plank platform, the upper set of timbers being hewed flat to receive the bedplate of the hoist. Round timbers make it a little more difficult to level the foundation, but are otherwise just as good, and often much cheaper, than the sawed lumber.

In building such a foundation the following notes will be found useful: The holes for the anchor belts should be bored ¼ in. larger than the bolts, in order to allow for the variations of the bedplate castings. The holes should be bored after the timbers are framed and placed in position, otherwise there is likely to be difficulty in getting the bolts through them. The lower ends of the anchor bolts should rest on something solid, a good-sized flat rock or a substantial piece of timber, so that they cannot be driven down out of reach by any accidental blow before the hoist is in position. The upper ends of these bolts should project far enough through the holes in the bedplate to permit of their being grasped with a pipe wrench in case they turn when the nuts are being tightened. If possible, the excavation for the foundation should be large enough for a man to get down into it and tamp under the mud sills after it is all put together. Even if the sills are leveled carefully at the start, the top may be found out of level, due to inequalities in the timbers. If round timbers are used it is practically impossible to level the foundation until it is completely assembled.

Setting the foundation with its greatest dimension parallel to the line from the hoist to the shaft gives the maximum stability. I have, however, placed the sills at right angles to this line where circumstances prevented their being laid the other way, making them somewhat longer in proportion to the rest of the foundation, so as to increase the area of the platform and, therefore, the weight holding the foundation in place. This design can easily be adapted to small compressors or other machines. Where a belted compressor is used, a satisfactory construction is to use the same sills as a base for both compressor and motor foundations.



Timber Foundation for Hoisting Engine

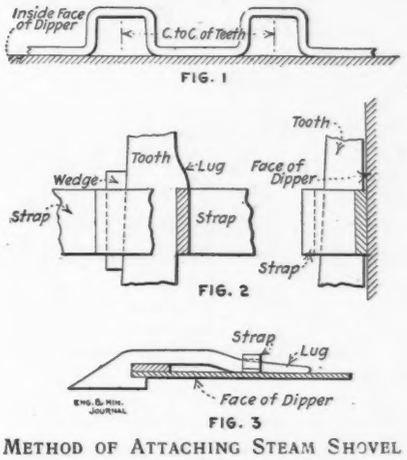
*Mining engineer, Colorado Springs, Colo.

Changing Dipper Teeth on Steam Shovels

By Clarence M. Haight.*

When digging iron ore with a steam shovel, it becomes necessary, at intervals of two or three weeks, to replace the dull dipper teeth with sharp ones. As there are four teeth used on a dipper, the time thus spent in the course of a season was an important item. Formerly, and at many mines at present, a tooth was fastened to the dipper with six 1-in. bolts. With this method much trouble was experienced at times; for, unless there was absolutely no play between the dipper and the tooth, the whole strain of the digging came on the bolts. In such a case the bolts bent so much that it was difficult to remove them.

On this account the changing of a tooth was generally done on Sunday in order not to delay operations. As it



Method of Attaching Steam Shovel Dipper Teeth

*Mining engineer, Hibbing, Minn.

is not necessary to change all the teeth at the same time, a part of almost every Sunday had to be devoted to this work.

At many mines now a new method of attachment is in use which makes the removal and the replacement of a tooth a comparatively simple matter. A scrap of ¾x5-in. iron, bent as shown in Fig. 1 of the accompanying drawing, is riveted inside the dipper on the face which digs the ore. The dipper tooth has a lug projecting from one side near the back end, as shown in Fig. 2. The loops in the strap are wide enough to admit the tooth and this lug easily. When the lug is behind the strap the inset part of the tooth fits against the edge of the dipper. The end of the tooth is pushed to one side until it touches the side of the strap. A wooden wedge is then driven in between the tooth and the other side of the strap to hold the lug in place. This completes the operation; the lug prevents the tooth from falling out and the edge of the dipper takes all the strain, as it should. To remove the tooth the operation is reversed; the wedge is driven out, any dirt in the way is removed, the tooth is shoved to one side until the lug will clear the strap, and the tooth is then pulled off.

The Mitsui Busan Kaisha is erecting a zinc smeltery at Omuta, in the Nagasaki district, Japan, near its new coking plant; another company, according to Consul Carl S. Deichman, has recently been organized in Osaka to erect a zinc smeltery.

Combined Transfer and Dump Car

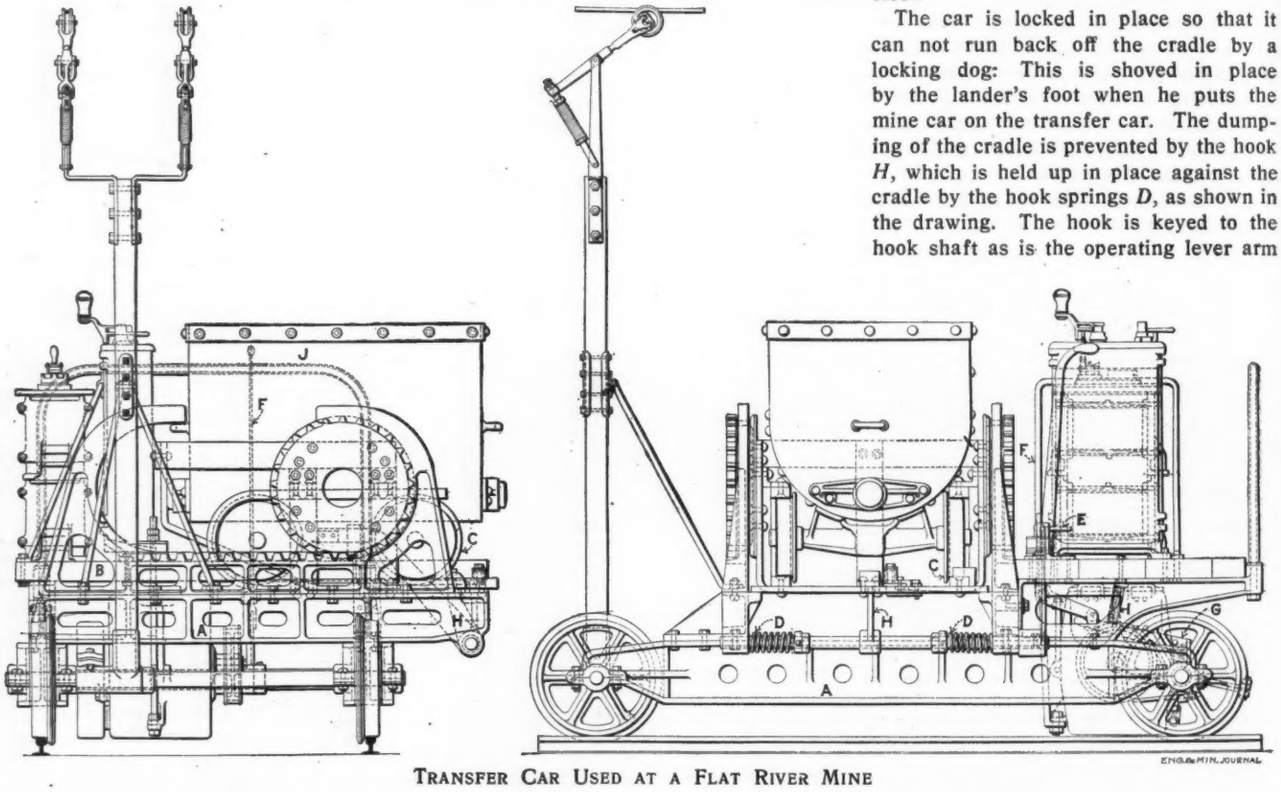
In the accompanying drawing is shown the construction of the transfer cars used at the shafts of the St. Louis Smelting & Refining Co. in the lead district of southeastern Missouri. The ore is hoisted to surface in ton cars on one-deck cages, and at surface, instead of tramming the ore to the bins by hand, it is put on the transfer cars which are equipped with motor drive. The method has its advantages and its disadvantages, but the construction of the transfer car is interesting as the idea is applicable to transfer cars used for other purposes.

The speed with which the men approach the shaft after the trip to the ore bins and the accuracy with which they bring the cars to a stop so that the rails of the dump on the transfer car justify with the tracks at the collar of the shaft, for there is not much leeway left them, is amazing and an indication of the accuracy that men attain with prolonged practice at their work. It comes with the skill with which the engineers at those Butte shafts where cages are still used in hoisting bring the cages to a stop with the deck of the cage even or only an inch or so lower than the level of a station, say 1600 ft. deep, so that the car can be pushed right on without any loss of time resulting from the use of landing chairs; or the way that some of the skilled carmen of the West in square-set mines come up at full speed to a turn-sheet about 6½ ft. square and slough their cars for a 90° turn without any noticeable hesitancy at the turn-sheet.

The frame *A* of the car is of cast steel. Longitudinal members extend out beyond the deck of the car far enough to take the bearings for the wheels. The motor which has a capacity of 14 hp. is mounted so as to mesh with the back axle, and the braking is done on wheels of that axle. The controller is carried on a raised platform resting on a cast-iron frame bolted to the main frame of the car. To the main frame and running crossways with it is bolted the dump frame *B*. This dump is of the traveling-cradle type which is especially good in this class of work. All castings are of steel.

The car is locked in place so that it can not run back off the cradle by a locking dog: This is shoved in place by the lander's foot when he puts the mine car on the transfer car. The dumping of the cradle is prevented by the hook *H*, which is held up in place against the cradle by the hook springs *D*, as shown in the drawing. The hook is keyed to the hook shaft as is the operating lever arm *E* of the hook by which the hook is pulled back off the cross bar of the dump cradle at the proper time. This lever controlling the dump is operated by the motorman's foot. The lever *F* extending up to the height of the controller is the brake lever which is operated by hand, as that allows the brake to be put on under closer control than if a foot brake were used. It is by this brake that the car is stopped even with the landing tracks, and so the brake is made extra strong. The brake link-lever *G*, is fitted with a spring *I*, which holds the brake beam off the wheels.

To prevent the motorman from falling off the car a railing of pipe *J*, is carried around the controller platform. A return wire is used on the trolley circuit so that a double-runner trolley pole is used.

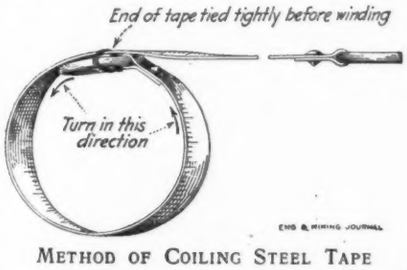


TRANSFER CAR USED AT A FLAT RIVER MINE

Of course it would be somewhat better if the bins were arranged so that the ore could be dumped into them without any long tramming, but where that is necessary and electric haulage is used about the plant as is the case at the plant of this company, a transfer car of this type carrying the dump on it is to be considered. It probably is cheaper in some respects than a conveyor for handling run-of-mine ore while it is more flexible. Moreover, by having an extra car it is possible to keep running when trouble arises in the motor without interfering with the hoisting from the mine. A conveyor system on the other hand, when it breaks down ties up the shaft. This is an important feature where the hoisting is done in cars and the ore is shoveled directly into the car, as at these mines, for there is little bin capacgity underground and a stopping of the hoists soon means a tie-up of the shoveling and the tramming. Of course, with mines having large underground bin capacity such a tie-up would not be so important and the flexibility of the system of the surface handling of the ore would not be so vital.

Coiling Steel Tape

Steel tapes, 100 ft. or over in length, are apt to be difficult to coil when no reel or spool is at hand. Unless great care is taken, twisting and kinking are



METHOD OF COILING STEEL TAPE

almost sure to result. The following simple method of coiling, recommended by Wallace G. Imhoff, superintendent, Duluth Diamond Drilling Co., Iron River, Mich., avoids any twisting or loose wrapping of stray strands: Give the tape one round, and tie the end tightly to the main body of the tape; the whole thing may now be easily and neatly coiled by standing at right angles to the coil, facing the tape, and turning the first round hand over hand in the direction of the operator.

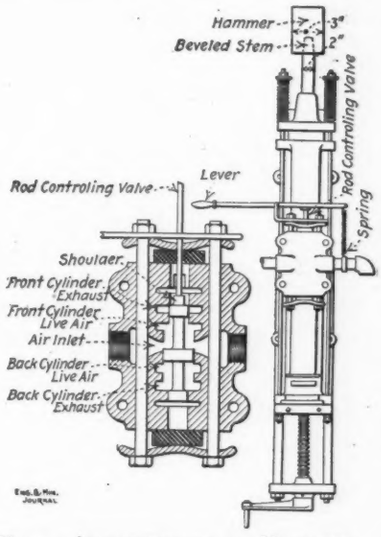
At the Forbes mine at Iron River, Mich., a new steel headframe has been erected. It is a new type in the Iron River district, being of the two-post style. Instead of being built directly over the shaft, it is all on one side and the skips are hoisted up along the outside of the headframe. It is similar to the Prince-of-Wales headframe at Negaunee; the latter, however, is of wood.

Variable Stroke Air Hammer

BY J. R. MCFARLAND

At Giroux Consolidated Mines Co., at Kimberly, Nev., an air hammer has been constructed for the blacksmith forge out of an old 3¼-in. rock drill. The delicate control of which the hammer is capable warrants its description. The arrangement is patterned after the design commonly used on drill-steel sharpeners and works much more satisfactorily than the customary throttle valve to govern the operation of the hammer. With a throttle valve the length of strokes cannot be varied; when the throttle is closed the hammer and piston drop to bottom and are in the way.

With the improved arrangement, both the power and length of the stroke are governed by a small rod extending through the front end of the valve chest hindering or releasing the valve.



VALVE ARRANGEMENT OF VARIABLE-STROKE AIR HAMMER

The rod has a small shoulder on the inside to prevent its coming out of the chest. The rod on the outside end fits against a lever with a spring attached to one end, holding back the valve when at rest and allowing air to enter in front of cylinder and hold the piston up out of the way.

As the handle of the lever is pulled back slowly, the air is first allowed to enter the back end of the cylinder in small quantities so that the strokes are light and short, the piston being reversed immediately after reverse port is passed.

As the lever is pulled farther back the drill gets its full supply of air and the momentum of the piston gives it a longer stroke. As the rebound from an iron anvil is greater than from rock a rubber buffer is placed in the back head. The neck of the piston was originally 1½ in. but as a 3-in. square hammer is used the neck was increased to two inches. The end of the piston neck or stem has a beveled fit in the hammer. The control is so delicate as to allow a piece of paper to be picked off the anvil by the hammer without the hammer touching the anvil.

Hydraulic Elevators in Placer Mining

BY A. H. MARTIN*

Economic disposition of tailings frequently perplexes the placer miner. The character of the work precludes the extensive employment of stacking equipment, and in many districts stringent laws prohibit the deposition of débris in streams affecting navigable water courses. In California, the hydraulic giant has been driven from most of the oldtime fields, largely because of the débris question. In other states the same exigency has militated against operations. To overcome this serious objection new methods are being incepted in California, Alaska and other placer fields which promise to eliminate the tailings question where conditions favor application of the practice.

In Siskiyou County, Calif., the tailings are handled and gravel treated extensively by the elevator method. The elevator is an inclined trough, usually eight feet wide and 80 to 100 feet long. The sides range from 12 feet wide at bottom to six feet at top. The bottom of the trough is composed of two sets of 1¼-in. boards, with one layer of boards forming the upper section. A double bank of boards forms the sides. From the elevator to the gravel extends a bridge, or approach, constructed of boards well supported. The bridge and first 20 ft. of the incline are solid and lined with ⅜-in. steel plate. The bridge usually has a length of 10 ft. Grizzly bars of 2½x6-in. timbers, protected with steel bands, are placed at the upper portion of elevator. The steel protectors are three inches wide and ⅜ in. thick. The sluice boxes contain transverse riffles, with longitudinal riffles placed at intervals to increase the gold-saving efficiency. Riffles are formed of 2x4 in. timber, covered with ¼-in. steel.

In operation two or more giants are employed. The first cuts down the deposit as in usual practice, while the second is stationed about 80 ft. ahead of the elevator bridge. As the first giant drives the gravel behind and alongside of the second monitor, the latter carries it on the bridge and the main portion of the elevator. It simply forces the material over an incline by the driving power of the water. The gravel passes over the grizzly bars and the fine material drops through and into the sluice boxes, while the coarse

*Redding, Calif.

material is shot over the top of the machine and drops to the tailings dump. It has been found feasible to handle 1200 cu.yd. of gravel per day, with two No. 3 giants using about 1200 in. of water under a 450-ft. pressure. Not only is ordinary gravel easily driven over the inclined machine, but boulders up to five feet in diameter.

As the tailings dump grows too close to the machine, stringers provided with a covering of double boards are laid on the pile and discharge of material carried beyond the first dump. By this means a vast quantity of tailings is readily stacked at a minimum of expense and time, with no danger of interference with operations. On a large property two or three such machines may be easily worked provided a requisite quantity of water is available. In some of the Siskiyou placers the elevator method is successfully used in mining gravel ranging in depth from 20 to 25 ft. with deposits containing numerous boulders. It has been found desirable to employ a third giant to drive the tailings to a barren dumping place, but when conditions are not sufficiently favorable for such practice, or when the operator is content with the method described, two giants perform work in an excellent manner. The elevator method is also employed in Alaska, South America, Oregon and other fields, and is particularly favored in districts where the deposits are of comparatively limited extent and the disposition of débris forms a prominent factor.

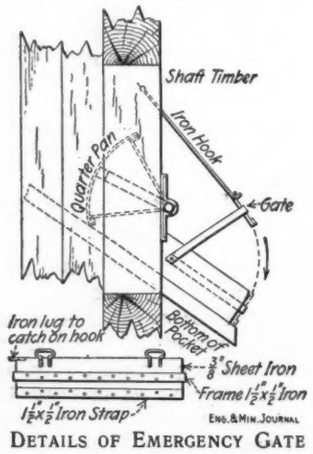
With an abundance of water and a large property, the method adopted by some Alaska placer operators invites consideration. By this system two or three monitors are stationed at the lower portion of the sluiceway, with their streams so directed that the tailings are met at right angles as they emanate from the boxes. The powerful streams of water drive the heavy gravel to the side and the pile is gradually built below and to the side of the sluice line. Thus the ground in front of sluices is constantly kept clear and the débris stacked at a convenient point. As the dump gains in height the monitors are gradually raised until a wall of gravel is constructed, somewhat resembling the tailings pile built up in dredging. The giants are raised and lowered as work demands and piles are built to a height of 15 to 20 ft. In this method an abundance of water is required and it can be employed only when conditions favor its use. Considerable of the fine material is carried into the streams by the water, but as this is permissible in Alaska no attempt is made to prevent its escape. In sections where regulations prevent this practice, the difficulty might be avoided by directing the water into restraining ponds, such as are used in many California placer enterprises operating in restricted territory.

In selecting methods for his own particular purpose, the operator is necessarily influenced by the natural conditions regnant in his own district. The popular Alaskan method, although satisfactory, would be of small use in a district where the water was expected to have a high duty. The elevator method has been comprehensively tested in several fields, and has demonstrated its merits beyond question. The machine is somewhat unhandy to move, four men with a mule, capstan and block-and-tackle requiring eight to nine days to change and set up a machine, including moving giants and pipe lines. Costs of operation are stated to average from six to seven cents per cubic yard, with the material usually heavy and somewhat difficult to handle. Where it is imperative that the tailings be handled effectively and economically, the method has proven especially worthy of close consideration.

An Emergency Ore Gate

By L. D. Davenport*

In one of the mines of the Chisholm district, considerable difficulty was experienced in cutting off the flow of ore from the underground pocket as soon as the skip was full. Frequently a hard chunk of ore or a piece of blocking caught under the curved gate or quarter-pan, and the fine ore continued to run, flooded the skip and necessitated cleaning out the skip pit.



Details of Emergency Gate

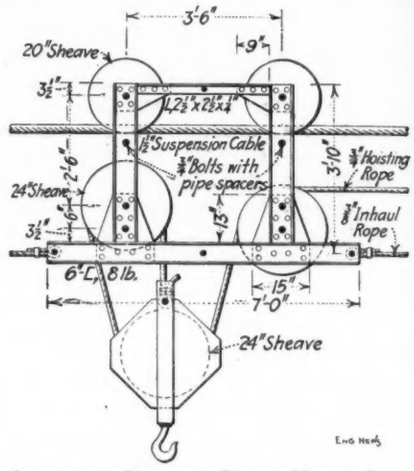
The emergency gate was designed to overcome this trouble and is now in general use in the mines in this district. As shown in the accompanying sketch, the gate consists of a simple ⅜-in. iron plate 8 in. wide and long enough to cover the end of the chute. It is supported in such a manner that it can be instantly dropped over the end of the chute and thus stop the ore in case an obstruction prevents the quarter pan from closing down tightly.

*Engineer, Oliver Iron Mining Co., Mesaba, Minn.

A Stiff Cableway Carriage

A cableway carriage used at asbestos mines, Thetford Mines, Que., is shown by the drawing herewith. Ten such carriages have been in service for more than two years, with satisfactory results. E. Torrey, Sherbrook, Que., who designed the carriage, describes it as follows (*Eng. News*, Oct. 31, 1912):

The carriage is built of structural shapes instead of the usual flat bars, giving it the advantage in strength,



Cableway Carriage Built Up of Stiff Shapes

lightness, cheapness and ease of assembling. The sheaves are the same as commonly used, with hubs 4 in. long and 2½ in. bore. A steel sleeve 2 in. in diameter and 4 1/16 in. long, bored for a 1-in. bolt, forms the sheave pin, and acts as a separator for the halves of the frame. A brass bushing 4 in. long is bored and turned to run free on the pin and in the hub, and is drilled with ⅜-in. radial holes to carry the lubricant. Beside the sheave pins, pieces of pipe over ¾-in. bolts are used as separators.

There is nothing unusual about the fall block, unless it be the side straps, which are bent to guide the block when it strikes the bottom chord of the carriage. Here the 6-in. channels give a stiff resistance, and so far have shown no sign of bending, whereas the usual flat bars last but a few months.

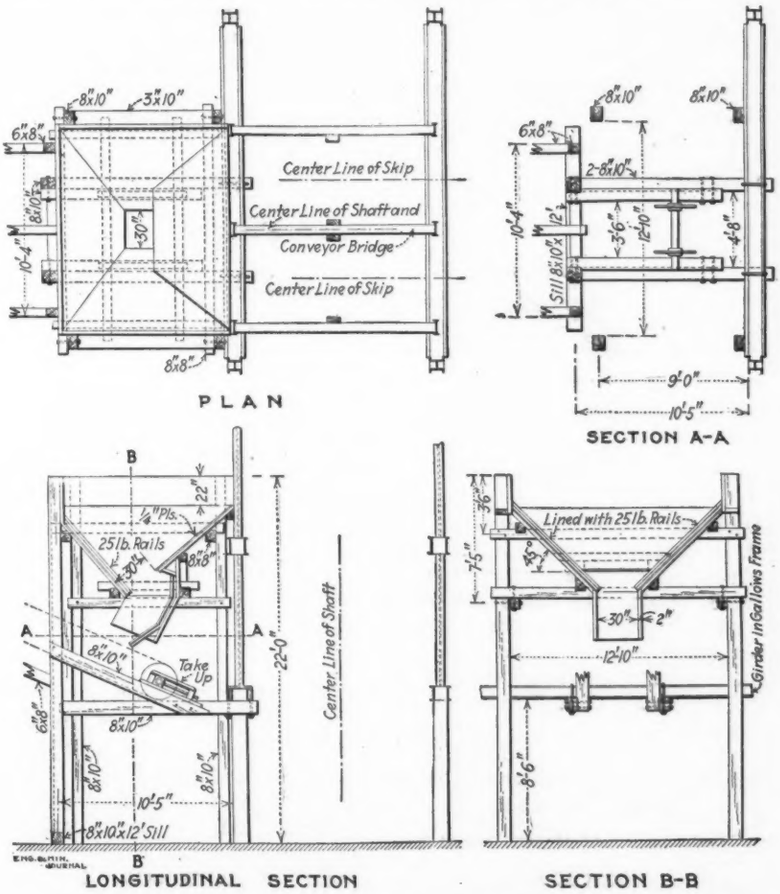
A feed wire for mine use should be of somewhat larger capacity than the trolley wire and should be run to the end of the haulage, says *Coal Age*. The current should be fed in every 500 ft., which allows all the motors to get about the same amount of current and avoids the stalling of one motor while another is on a heavy grade.

Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Transferring Mine-Run Ore from Skip Pocket to Bin

Surface buildings and a high headframe make it inconvenient to dump the ore directly into the ore bin from the skips, at the No. 1 shaft of the Federal Lead Co., in southeastern Missouri. The skips dump into a receiving pocket; the ore is then elevated by a conveyor to the bin, which is about 90 ft. distant from the shaft. The conveyor is of the flat, lapping-pan type, and is set at an angle of about 23° and housed in a bridge of the ordinary style. At the top of the ore bin is placed the 25-hp. motor, which drives the conveyor at a speed of about 70 ft. per minute.



RECEIVING POCKET AT ONE OF THE FEDERAL LEAD COMPANY'S MINES

The details of the receiving pocket, which has a capacity of about 10 tons, or approximately two skips, are shown in the accompanying drawing. The top is wide enough to receive the ore from both skips, while the bottom is contracted to feed directly upon the 30-in. conveyor pans. The pocket is lined with plates, and where the wear is heaviest rails are used instead of plates.

If a boulder becomes wedged at the bottom of the feed hopper, the attendant, who is always on duty, throws a switch, stopping the conveyor-drive motor. At the same time he closes another circuit, which causes a bell to ring in the engine room; while this bell is ringing the hoisting engineer does not dump the skips. The attendant can thus go into the feed pocket and sledge the boulder until it is small enough to go under the lip of the feed hopper. The upkeep of the conveyor is small and it seldom gets out of repair. About 1800 tons per eight-hour shift are handled without difficulty. In many ways it would be better to dump directly into the ore bin, but where conditions make this impossible, the receiving pocket and conveyor is feasible.

Melting and Refining Precipitate at Tigre Mill

At the Tigre mill, El Tigre, Sonora, Mex., the Merrill process of zinc-dust precipitation is used. The following description of the methods employed in melting and refining the precipitate is taken from an article by D. L. H. Forbes in the August *Bulletin* of the American Institute of Mining Engineers.

The precipitate taken from the presses is dried in an electrically heated car, which has a series of superimposed shallow pans, under which the resistance coils are placed. On account of the large amount of moisture given off from the precipitate while drying, the resistance wires have to be protected by an asbestos paint covering in order to prevent corrosion. The car has a capacity for drying 1000 lb. of precipitate in 10 hr. and takes 4.5 kw. of power.

Melting is done in two No. 125 crucible Steele-Harvey oil-burning furnaces of the tilting type. The object of the melting is to fuse the precious metals and to remove as much of the copper and zinc as possible in a slag which will also carry off the baser impurities, such as alumina, silica, lime, and iron. To effect this purpose, fluxes are added to the precipitate in such proportions that the oxides of copper and zinc find sufficient finely powdered silica present to unite with it and form subsilicates; the oxides of iron, aluminum, and calcium find sufficient borax and silica to dissolve or unite with them; while a little sodium bicarbonate and fluospar are added to make the slag fluid.

The precipitate analyzes as follows: Au, 0.3%; Ag, 63.13%; Cu, 1.5%; CuO, 3.14%; Zn, 2.0%; ZnO, 3.23%; SiO_2, 11.6; Al_2O_3, 5.7; Fe_2O_3, 1.3%. For the melt 100 parts of precipitate are fluxed with 5.7 parts of silica, 5 parts of borax, 0.6 part of fluorspar and 9.1 parts of soda bicarbonate. When fluxed in this manner the precipitate melts down nicely. As the charge sinks in the crucible, fresh precipitate, mixed with flux, is added about every 20 min. until the crucible is nearly full of metal and slag in a state of quiet fusion. The slag is then poured into a conical pot, in which a crust is allowed to form to a thickness of 1 in.; the molten slag inside the crust is run out on cast-iron floor plates.

The crusts from this operation usually contain a small button of gold and sil-

ver at the point of the pot, and this button is broken off, and either put back in the crucible, or, if matte be present, is saved for a separate treatment with other similar buttons. The crusts themselves carry sufficient gold and silver to warrant a remelting, while the molten slag that is run on the floor is low in value, and, once a month, is weighed, sampled, and returned to the head of the mill.

After two to three pourings of slag, the molten metals in the crucible are subjected to a refining process, which depends upon the rapid formation of the oxides of zinc and copper when these metals are exposed to the air at high temperature in the molten state. With the furnace tilted forward, the operator throws a handful of bone ash over the surface of the molten metal. This thickens whatever slag still remains, and enables it to be easily removed by means of spirals of 0.5-in. round iron. The air striking the exposed surface of the metals rapidly oxidizes the zinc and copper. After a couple of minutes, borax is thrown on and dissolves the oxides, forming a slag, which is thickened with bone ash and removed as before. After about two repetitions of this refining, the precious metals are ready for pouring.

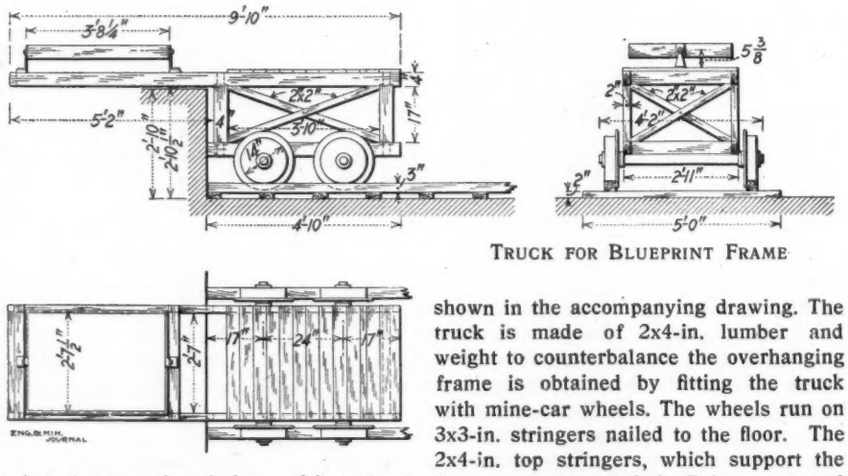
The furnace is tilted back and the heat applied for about 5 min. with the cover over the crucible. A step-bottomed truck, with bullion-molds that have been heated and greased with a mixture of oil and flake graphite, is then run in front of the furnace, the mold on the highest step being set in front of the spout. The bars of bullion are poured by tilting the furnace forward over each of the molds in turn. After removal from the molds and cooling, the bars, which weigh from 1200 to 1300 oz., are chipped, sampled by drilling top and bottom, and stamped, ready for shipment. By this process, in spite of the high content in copper carried by the precipitate, bars from 850 to 900 fine are obtained.

From 20 to 30 lb. of flue dust are collected and removed each month from a large chamber outside the melting-room through which the furnace gases are led. A typical analysis of the flue dust is: Au, 0.01; Ag, 21.39; Cu, 10.40; Zn, 7.50; SiO_2, 11.08; Al_2O_3, 2.90; Fe_2O_3, 2.30; undetermined, 44.42 (chiefly particles of borax, fluorspar, etc.); total, 100 per cent.

For the remelting of slag crusts, scraps of iron box bands are added to the slag in the proportion of about 0.5% of the weight of the slag, and the slag put through the furnace until a button of sufficient size to collect in the mold is obtained. Slag assaying Au, 1.98; Ag, 650 oz. per ton; Cu, 7.5; Zn, 13.5; SiO_2, 28.1; Al_2O_3, 11.34; Fe_2O_3, 4.76 per cent. was reduced in this manner to Au, 0.06 and Ag. 32.34 oz. per ton; yielding metal that assayed Au, 0.147; Ag, 40.183; and Cu, 42.4 per cent.

Truck for Blueprint Frame

A simple truck for carrying a blueprint frame, which allows the frame to be pushed through an open window, is shown in the accompanying drawing. The truck is made of 2x4-in. lumber and weight to counterbalance the overhanging frame is obtained by fitting the truck with mine-car wheels. The wheels run on 3x3-in. stringers nailed to the floor. The 2x4-in. top stringers, which support the frame, are spaced 2 ft. 7 in. apart and extend 5 ft. from the front of the truck; this allows the printing frame to be moved to any angle on center supports.



TRUCK FOR BLUEPRINT FRAME

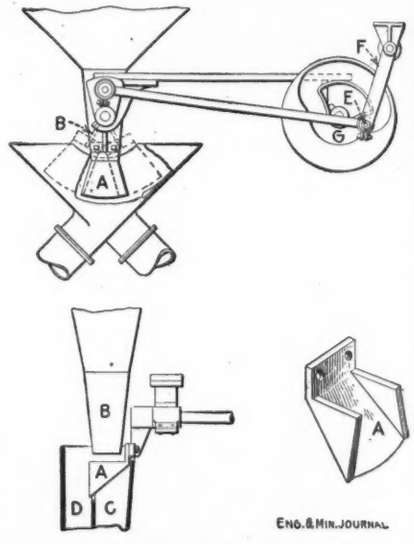
Float for Solution Sump Indicator

Generally speaking, solution-sump indicators are troublesome for the reason that the cork or wooden floats usually get waterlogged and so become unreliable. A simple float that avoids this difficulty is described by Percy L. Morrisby (*Journ. Chem. Met. and Min. Soc. of So. Africa*, August, 1912).

The float is made of a fair-sized drum, a 10-gal. paint drum serving the purpose admirably. The ends of the drum are made tight; two holes are drilled in the middle of the sides to receive a length of ¾-in. iron pipe, which is soldered in position at right angles to the long axis of the drum. The object of the short piece of pipe is to hold the float in position; it should project about one inch on either side of the drum. A rod of ⅝-in. round iron, long enough to reach from the bottom to the top of the vat, serves as a guide for the float; this is screwed into a piece of flat-iron plate, say 12x12x½ in., which rests on the bottom of the vat about nine inches from the side, the upper end of the rod being supported in a suitable manner. The float is placed in position on the rod and connected to the indicator board by pliable steel wire. To keep these drums in good order, a coat of tar applied twice a year is recommended.

Sheridan Oscillating Ore Sampler

Leslie M. Sheridan, of Anaconda, describes a new oscillating ore sampler in U. S. Pat. No. 1,031,385. The main features are the lightness of the moving part, which is exposed to wear, and the ease of replacing it in event of injury. The device consists essentially of a cutter *A*, oscillating in a sampling hopper, which is divided into two longitudinal sections, each of which has a separate delivery spout. When the cutter *A* is at either end of its oscillation, the ore flows through spout *B* down into section *C* of the sample hopper, and on to the ore bins. When the cutter *A* swings under spout *B* the ore is deflected to the sampling apparatus proper.



SHERIDAN SAMPLER

The patent also covers a peculiar cam motion, which regulates the relative periods during which the cutter is under the spout and when it is not. This motion is the resultant of the motion given the rocker arm *F*, because of the pin *E* having to follow the cam groove *G* as the wheel rotates.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Aluminum Peroxide

The preparation of an aluminum peroxide by A. Terni is noted in the *Journal* of the Society of Chemical Industry, Sept. 16, 1912 (Abstr. from Atti R. Accad. dei Lincei, Rome, Vol. 21, p. 104).

A concentrated solution of potassium aluminate prepared by dissolving freshly precipitated aluminum hydroxide in the smallest possible quantity of 50% potassium-hydroxide solution, was treated with excess of a 30% solution of hydrogen peroxide, and the precipitate produced was filtered off with the aid of the pump, washed well with water, then with alcohol and ether, and dried in the air. The light, amorphous, white powder thus obtained had the composition, Al_2O_3. Al_2O_4. $10H_2O$, and exhibited the properties of a true peroxide. It dissolves readily in alkalis, without evolution of oxygen, probably owing to the formation of peraluminates. If the precipitate produced on adding hydrogen peroxide to potassium-aluminate solution, be rapidly filtered off and pressed between absorbent paper without washing, a product is obtained in which the ratio of active oxygen to alumina is approximately 1:1. This substance, Al_2O_4, is decomposed by water and slowly, even on keeping, with formation of the compound, Al_2O_3. Al_2O_4.

Avoiding Loss in Brass Founding

In *Metallurgie*, p. 523, 1912, F. Bensel gives the results of some attempts to diminish the losses in brass founding. Direct addition of zinc to melted copper in a crucible heated electrically produced hardly any alloy, the zinc volatilizing and oxidizing. Several attempts to substitute for the zinc an equivalent quantity of blende, the copper being in sufficient excess to form cuprous sulphide with the sulphur of the blende, and sodium sulphide being used as a flux, were also unsuccessful; the brass produced never contained more than about 12% of zinc, and great quantities both of copper and zinc were lost in the slags. Sodium and calcium carbonates used to flux the blende were also unavailing. Finally, the metals were melted together in a closed egg-shaped furnace, through the center of which passed carbon electrodes joined by a rod of resistance carbon. The furnace could be rotated so as to agitate and mix the metals, and had a covered opening through which the alloy could be poured. There was practically no loss of zinc, and the resulting brass was almost exactly of the composition (70:30) calculated for. The cost of melting a ton of brass was about $1.50 for power (in a furnace taking 50 kg. at a time), and about 55c. for resistance carbon. The saving in zinc, as compared with the ordinary process of manufacture, may be taken at 60c. per ton of brass.

Electrolytic Zinc Production

"Zinc Electrolysis in Aqueous Solutions" was the subject of a paper read by Doctor Engelhardt, at the recent annual meeting of the Association of German Metallurgists, says the *Mining Journal*, Oct. 26, 1912. The lecturer demonstrated how, after strenuous exertions, extending over fully 30 years, to solve the problem of producing metallic zinc by an economically and technically unobjectionable electrolytic method, the only group of processes now held to be deserving of consideration is that in which chloride or sulphate solutions are dissociated by insoluble anodes and without utilization of the functions of the anodes.

The chloride electrolysis (more particularly the Höpfner process) has, for various reasons, so far proved a failure, but with sulphate solutions success, though only a qualified one, may be obtained, if proper attention be paid to the material of the anodes. Exhaustive experiments in zinc-sulphate electrolysis carried out at the Siemens-Halske works with anodes of massive peroxide of lead or manganese have proved that, technically speaking, the problem has been satisfactorily solved. From the economic standpoint, however, it is pointed out that under ordinary circumstances an electrolytic zinc works can, owing to high working costs, operate satisfactorily only if it turns out the high-priced, entirely pure metal with more than 99.9% zinc. But, though metal of that quality is saleable in comparatively small quantities at considerably higher prices than the usual refined brands, its consumption is of far too limited a character to admit of an electrolytic production on a large scale. In order to install works for that purpose with economically satisfactory results, it would be indispensable to reduce the working costs to such an extent that they leave a sufficient margin of profit at ordinary zinc prices. That, however, would only be possible in localities where either very cheap power is available, or where the ores, for some reason or other—for instance, their refractoriness or difficult transport conditions—are obtainable at materially lower prices than the usual market rates.

Alumina in Iron Furnace Slags

In a paper presented before the International Congress of Applied Chemistry, J. E. Johnson, Jr. gives the results of observations on the *rôle* of alumina in iron blast-furnace slags. It is his opinion that alumina acts neither as a base nor an acid in slags, but only as a diluent, affecting its viscosity, but not its chemical nature.

SLAG COMPOSITIONS

	Al_2O_3 %	SiO_2 %	CaO by diff.*	$\frac{CaO}{Al_2O_3+SiO_2}$	$\frac{CaO+Al_2O_3}{SiO_2}$	$\frac{CaO}{SiO_2}$
Virginia	6.5	36.0	54.0	1.27	1.68	1.50
Lake Ore	13.5	33.0	50.0	1.08	1.92	1.51
Experimental	36.0	24.7	36.8	0.59	2.90	1.44

*After allowing residue not Al_2O_3, SiO_2, or CaO, of 3.5%.

Comparing a slag which ran for 24 hr. with 36% of Al_2O_3 with slags produced in standard Virginia and Lake-ore practice, gives the accompanying table.

There seems to be no reasonable basis for calculating acidity or basicity on the basis of this table except to regard the alumina as a diluting element only. Again, in foundry-iron practice, it will be found that the lime-silica ratio will always be between 1.2 to 1.4.

There seems to be a well defined opinion among furnace men that alumina has the effect of making the slag viscous and stringy over a certain range, beginning about 16, reaching a maximum about 20, and disappearing between 25 and 30%. Mr. Johnson suggests that a portion of this stringiness is wrongly attributed to the alumina, and that it is really due to

attempting to figure the alumina either as acid or base, and consequently getting an incorrect lime-silica ratio.

In figuring lime-silica ratios it is the author's opinion that magnesia should only be figured as equivalent to lime, weight for weight. This he explains by the supposition that the chemical activity of magnesia is less than that of lime in just about the proportion that its molecular weight is less, instancing as proof of its inertness that quicklime can be added to a soda solution to deprive it of carbon dioxide, whereas magnesia, under like conditions, is inert.

Some of his general observations on slags are also of interest. For instance, for "several years technical literature contained many learned discussions on the oxygen ratio of the acids and bases, all on the assumption that they must be present in a ratio depending on molecular weight and valency."

"A wider knowledge of the blast furnace now enables us to say that for practical purposes this work has been of almost no value. It is now generally admitted that on the physical side the important point of a given slag is neither its total heat of fusion nor its softening point, but its free-running temperature, since this is the critical temperature of the furnace.

Shipping Cement in Bulk

The recent experiments of the Universal Portland Cement Co. on shipping cement in bulk have already been commented on. The company has now issued another circular dealing with the matter, concerning which *Engineering News* makes the following comment:

When one computes the cost of all the items involved in packing and handling cement in bags, it is probable that a total saving of not less than 25c. per bbl. on the cost of cement could be made by handling it in bulk instead of in bags. There is no difficulty in shipping cement in tight box cars; and if rain finds entrance to the car through the roof or sides, the damage to the cement is less than if it were shipped in bags instead of in bulk.

Besides the economy to the cement manufacturer and user, it is worth while pointing out that from the standpoint of the quality of the product, engineers should favor the use of cement in bulk. The even aëration which bulk cement receives in handling from the car to the mixer will have the same effect in securing the certain hydration of any free lime particles that is sought by the specifications which require cement to be stored a certain time before using.

There is doubtless a certain prejudice in favor of the use of cement in bags because it is easy to get the right proportion of cement by counting the number of bags put into a batch of concrete. There is, however, always the chance that the man on the mixer may make a miscount and put in perhaps one bag too few so that there will be a lean batch of concrete turned out, or one bag too many, wasting cement. With cement in bulk the proper amount of cement for one batch is measured just as the stone and sand are measured, and there is no chance for making an error. We are informed that bulk cement is now being shipped and used with great satisfaction and economy on some large contract work as well as in factories using cement in the manufacture of sewer pipe and other cement products.

Copper Smelting in the Electric Furnace

Mr. Stephen, the manager of the Ugine smelting works, Savoy, has recently published the results of exhaustive experiments on smelting in the electric furnace, says the *Mining Journal*, Oct. 26, 1912.

For copper-ore smelting, he used as reducing agents charcoal, coke and anthracite, all of which proved suitable; limestone served as flux. The electrodes consisted of carbon, and partly soft-steel poles and water-cooled copper poles were employed. The ores contained from 10 to 20% CuO, 30% SiO_2, 10% Al_2O_3, 3 to 5% CoO, and from 7 to 32% moisture. The product obtained was never anything better than black copper, spoiled by considerable quantities of cobalt, iron and silicon. From 1000 to 1200 kw. current and 8 kg. of electrodes were consumed per ton of ore, and the consumption of the reducing agents averaged 25% of the copper contents of the charge. As a result of his experiments, Mr. Stephen comes to the conclusion that for producing copper the electric furnace is not promising. The smelters now in use, he says, are working so economically that the electric furnace cannot be expected to compete with them, except, perhaps, in localities which, while rich in water power, are poor in solid fuels, and where transport of ores would be difficult. Mr. Stephen said that zinc and nickel ores gave similar results.

Danger from Dust Inhalation

In Sir Thomas Oliver's paper before the International Congress of Hygiene were some interesting statements concerning what becomes of inhaled dust, particularly as throwing light on plumbism. In experiments by Dr. Yoichiro Saito, dogs and rabbits inhaled air charged with white-lead dust from one to 33 hr. The greater part of the dust was subsequently recovered, not from the lungs, but from the alimentary canal. In experiments with men and white-lead dust, 95% of the dust inhaled remained behind in the body, and from 60% to 80% eventually found its way into the alimentary canal, apparently by mixing with the nasal mucous and being subsequently unintentionally swallowed. These experiments show the necessity for respirators, and the good of frequent nasal douches, and that simply to avoid contamination of food, etc., with lead dust is not enough.

Properties of Tungsten

Some of the interesting properties of tungsten were given before the International Congress of Applied Chemistry, by C. G. Fink, of the General Electric Co. Its density is 19.3 to 20.2; tensile strength, 322 to 427 kg. per sq.mm.; coefficient of expansion, 4.3×10^{-6}; specific heat, 0.0358; hardness, Moh's scale, 4.5 to 8.0; melting point, 3100° C.+. The ductile metal is practically insoluble in all common acids, and it can be drawn to a thinner wire than can any other metal. Tungsten gauze has been used as a filter in the laboratory, and is recommended for use commercially, e.g., for filtering electrolytic slime in refineries. [It would appear that capital expenditure might cut some figure here.—EDITOR.]

It is well suited for standard weights because of its high specific gravity, its incorrodibility in air, and because it is so hard it will scratch glass; acid-proof dishes and tubes have been made for laboratory use; because of its great ductility it is well adapted for galvanometer suspensions, and for cross hairs in scientific apparatus; and because of the same property it is recommended for use in surgery. Tungsten resistors are of two types, tungsten wire helix on an aluminum tube, sealed in a hydrogen atmosphere; and a tungsten tube, replacing the carbon tube in an Arsem vacuum furnace. The tungsten-molybdenum couple is used in thermo-electric work; its electromotive force increases to about 12½ millivolts at 540° C., then decreases to 0 at 1300° C. Owing to its elasticity and paramagnetic properties, it could be used in electric measuring devices, watch springs, etc.

In the discussion, Doctor Fink said the cost of pure tungsten was $10 to $12 per pound. Other uses of this interesting metal are noted on p. 642, ENGINEERING AND MINING JOURNAL, Oct. 5, 1912.

Boiling Points of Metals

The boiling points of various metals were determined by means of an optical pyrometer by H. C. Greenwood (*Chem. News*, 1912, pp. 31, 42) at the time vaporization became sufficiently vigorous to project drops of metal from the surface. These boiling points at atmospheric pressure were: Ag, 1955° C.; Al, 1800°; Bi, 1440°; Cr, 2200°; Cu, 2310°; Fe, 2450°; Mg, 1110°; Mn, 1900°; Pb, 1525°; Sb, 1420°; Sn, 2275° Centigrade.

Dredging on Butte Creek, California

By Lewis H. Eddy

Two bucket-elevator gold dredges, showing many differences in constructional details, are operating in Butte County. The older, originally of 11-cu. ft. open-link type, was recently remodeled for 5-cu. ft. close-connected buckets. The other dredge is equipped with 4-cu. ft. close-connected buckets of special design.

There are two bucket-elevator gold dredges on Butte Creek, about 10 miles north of east from Chico, Butte County, Calif. The older dredge was originally equipped with 11-cu.ft. open-link buckets of special design which, in October, 1912, were being displaced by 5-cu.ft. close-connected buckets of Bucyrus standard type. The newer dredge is equipped with 4-cu.ft. close-connected buckets of special design. The Butte Creek field is distinct and separate from the Oroville field, although in the same county and only about 18 sectional miles in a west of north direction from the Feather River district. Geographically the two fields are so closely related that Butte Creek, like Honcut and Wyman Ravine fields, is generally considered tributary to the Feather River district. The headwaters of the two streams flow nearly parallel and are only three to six miles apart, but Butte Creek is tributary to Sacramento River.

Two Dredges Operating

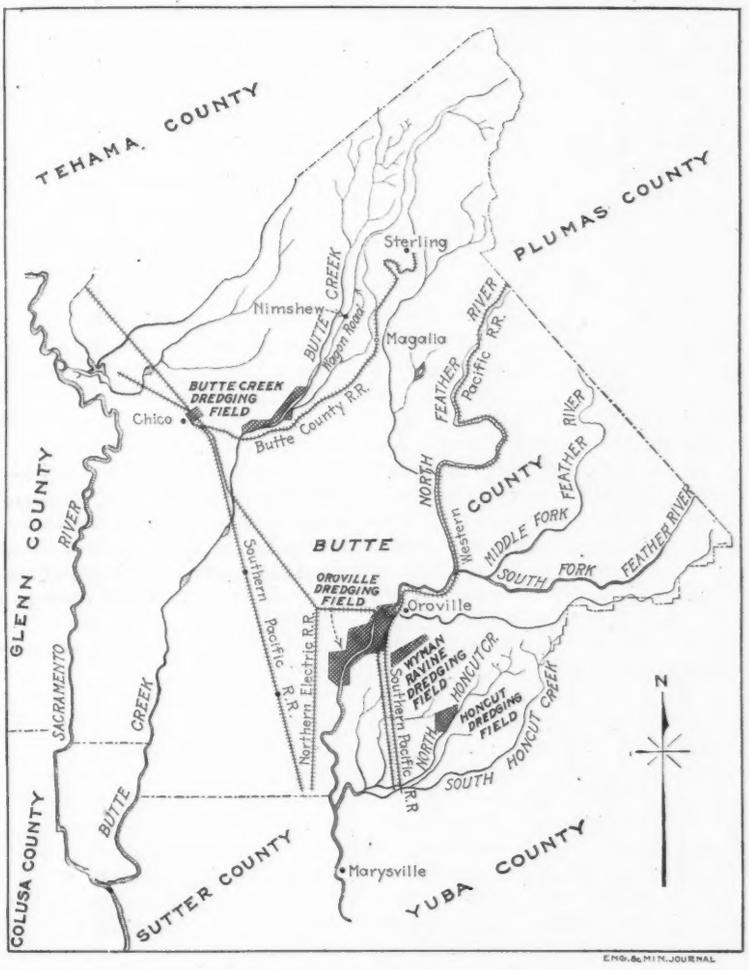
The older dredge on Butte Creek was installed in April, 1909, by the Butte Creek Consolidated Dredging Co.; the newer one in June, 1911, by John Ross Wade. The dredges are unlike in most of the constructional features and were initially wholly unlike in bucket design, though in general construction and design the buckets were both classed as California type. The essential difference between the 11-cu.ft. and the 4-cu.ft. buckets was particularly noticeable for the reason that both were operating in similar, if not precisely the same, character of gravel and only about two miles apart on the same stream bed.

The older dredge is equipped with deck and tail sluices and tail scow constructed for saving the gold and disposing of the tailings. The original buckets were designed with square-cornered wide mouth, deep and narrowed at hood and bottom. The buckets of the newer dredge conform more to the California type, but are of circular-shape mouth design, shallow and rounded at bottom and hood; the gold-saving tables are a modification of the standard type, and the tailings are handled with a belt conveyor. In other parts the machinery is of standard type, though differing in some features of arrangement from usual practice, due to physical conditions not usually considered and to specific results which the operator desires to attain as economically as possible. The operation of the newer dredge is improving the channel of the creek, and the older dredge is replacing the land in condition for agriculture, which, in a measure, account for some of the differences in mechanical arrangement.

The Butte Creek Consolidated dredge was originally equipped with thirty-nine 11-cu.ft. open-link buckets, designed by E. L. Smith, of New York, and with Taylor Iron & Steel Co. machinery. The digging ladder, 83½ ft. long, is constructed of steel, weighing 80,000 lb. It was designed to dig 35 ft. below the water line, with from eight to 12 buckets dumping per min. The spuds are 28x48 in. in section and 50 ft. long; one is steel, the other wood. The steel spud weighs 20 tons; manganese steel is used at points of greatest wear. The hull is 109 ft. long, 40 ft. wide, 9 ft. deep, 4½-ft. draft.

The gravel was washed in a revolving screen 12 ft. long, 8-ft. diameter, perforated with 6-in. and 10-in. holes, and made of manganese steel. The boulders of more than 10-in. size passed the perforations and were carried off at either side of the boat through steel chutes. The smaller gravel and sand, passing through the screen holes, dropped to the main sluice, built on deck beneath the screen, and were carried on and through the tail sluice supported by the tail scow.

The main sluice is 36 ft. long and the tail sluice is 120 ft. long. They are equipped with manganese-steel riffles made in sets 4-ft. square and 4⅞ in. deep. The scow is equipped with undercurrent and tables for fine gold. A 15-in. pump furnishes water for the sluices. The dredge is electrically driven; the motors are direct connected and have a total rated power of 375 hp., distributed as follows: Digging ladder, 150 hp.; winch, 85 hp.; screen, 15 hp.; sluice pump, 100 hp.; primary pump, 25 horsepower.



Dredging Fields in Butte and Yuba Counties, California

The rated yardage capacity of the dredge was 100,000 cu.yd. per month. At the time of my first visit, during the operation of the old bucket line, the buckets were carrying about 75% of the capacity of 11 cu.ft. Much of the gravel or boulders ranged in size from 12 to 20 in., though these large rocks were more noticeable passing through the chutes than an equal quantity of the same size would be in passing over a belt conveyor; the separation of the rocks above 10 in. from the remainder of the material, taking place in the screen, also attracted closer notice to the size of the large pieces than would be attracted to the same sizes passing through a revolving screen 35 ft. long, carrying all the gravel to a belt conveyor and delivering only the fines to the riffle tables. Some of the boulders carried off through the chutes were from 24 to 48 in. in size; but these extraordinary rocks are not confined to this part of the creek, nor are they confined to the Butte Creek field; they are found in nearly all dredging districts of the state, though there are fields where the gravel runs more uniformly to smaller sizes.

Buckets of Unusual Design

The peculiar lip design and hopper-like shape of the hood and bottom of the old buckets attracted the attention of the most casual observer. The hood and bottom were in one piece, having an acute pitch that gives a small bottom surface, compared with the width of the mouth. The lip was double riveted and made especially strong, the corners being raised about two inches higher than the front edge of the lip and the sides of the hood. This extra strength is designed to withstand heavy digging and the extra wear to which the corners of all buckets of square-shaped mouths are subjected. The theory of the designer was that the projecting corners would save the bucket and distribute the wear evenly.

So far as the body of the bucket is concerned, the desired result may have been attained, but the wear on the lips was decidedly uneven. Theoretically, the corners of the lips would be the first to give way to the grinding effect of uniform-sized gravel and the heavier contact with the large rocks; the practical result has been that the lower or front edges of the lips on many of the buckets were as badly worn as were the corners on other buckets. The failure of the buckets to dig the full capacity was not necessarily attributable to the shape of the bucket, nor the uneven wear of the lip, nor to any other single feature or combination. There are physical conditions of the ground in many instances to be considered, and the inclination of the operator to drive the dredge at less than full capacity may have governed.

The only point of dissent with the theory of design of this bucket is that the raised and strengthened corners of the lip tend to an even distribution of the wear, for the contrary effect has been plainly demonstrated not only by this dredge, but by dredges equipped with the older Bucyrus buckets. It is admitted by operators of dredges equipped with hood-shaped buckets of less pitch and rounded bottoms that the hopper-shaped bucket will dump more efficiently; but this admission contemplates the employment of the hexagonal upper tumbler, and does not consider the square or four-sided tumbler to be practicable. But the standard bucket with less pitch, built on the hopper-shape plan, in accord with the dumping theory, is designed with a rounded instead of a flat bottom, upon the theory that the gravel, especially the irregular-shaped larger rocks, is more readily released. However, the speed at which the buckets are dumped and the difference in action of the open-link and the close-connected buckets have a bearing on the practice in considering the merits of the buckets of various designs; and the four-sided tumbler also may possess merits that are worth considering.

Dredge Equipment Being Changed

The operation of this dredge stopped in June, 1912, and the bucket line was dismantled preparatory to the installation of the new bucket line of 5-cu.ft. close-connected manganese-steel buckets of the standard Bucyrus type. The old bucket line was operated for the three years with the addition of only one new bucket, there having been 40 buckets of the original design and construction while the line carried 39. The old buckets were manufactured by the Brake Shoe Co., of Chicago, which has been succeeded by the American Manganese-Steel Co. The latter company built the new bucket line. These buckets are being delivered at the dredge complete for installation; no machining or other work will be necessary.

It is the intention of the operators to change the revolving screen; the new screen, or the remodeled old one, to be 32 ft. long instead of 12 ft. as at present, the perforations graduated from ⅜ in. to ½ in. It is expected, also, to take out the present sluiceways and install the usual type of gold-saving tables. In the operation of the dredge it was found that the gravel was so large that the quantity of water required for washing and carrying away the heavy gravel through the sluices was expensive, and that with this large volume of water much of the fine gold was carried away and lost. It was expected that the remodeled dredge would be ready for operation sometime in November of the present year; although it may be decided to install the other changes before placing the dredge again in commission.

Three years is an extraordinary record for the life of a bucket line without addition of new buckets; but the dismantled buckets examined on my last visit were found to be badly broken and worn, and wholly unfit for further economic service. Whether the buckets performed sufficient profitable service in the three years to warrant the maintenance of the line intact is known only to the operators of the dredge. The common practice in dredge operation is to displace the broken or badly worn buckets with new ones, and thus maintain a competent bucket line continously, or until a new design of bucket may be decided upon. The substitution of the 5-cu.ft. for the 11-cu.ft. buckets would seem to warrant the assumption that the original buckets were found to be too large and cumbersome to be operated to their full capacity by this boat. It is not probable that the 11-cu.ft. buckets carried at any time, continuously, their full capacity. Buckets carrying an average load are less liable to excessive wear and breakage than buckets carrying 50 or 75% of capacity. The results of general practice in dredge construction and operation indicate that 5- or 7-cu.ft. buckets are more economical for this size dredge and the character of gravel which it has been digging.

The Butte Creek Consolidated Dredging Co., operating the dredge above described, has total land holdings of 1450 acres, situated in T. 22 N., R. 2 and 3 E. Of this area, 500 acres were dredgeable, and about 100 acres have been worked. The gravel averages about 20 ft. in depth, and contains some clayey material; the bedrock is lava. H. P. Galligan, of Chico, is superintendent.

Wade Dredge Operating Along Live Stream

The land on which John Ross Wade is operating a dredge of his own design and construction is situated in T. 22 N., R. 2 E., about two miles southwest from the Butte Creek Consolidated lands. The gravel averages 27 ft. in depth, and contains a large proportion of coarse material and many boulders from 20 to 40 in., and some larger. The stream channel at this point courses between bluffs or mesas about 300 to 600 ft. high. The country rock and the bedrock of the creek are of the same lava formation that extends for several miles northerly to the Nimshew and easterly to the Magalia drift- and lode-mining districts.

In September, 1912, after about 15 months' operation, the dredge was overturned in about 26 ft. of water, the port side resting on the bed of the stream, the deck standing at an angle of 90° from horizontal. It required about one month of time and the services of a diver to right the boat. It was again in operation in October. The overturning of the dredge resulted indirectly from a break in the digging-ladder hoist. The jarring caused by this break made a break in the tailings-stacker support, which swung the stacker to port. The starboard-side line

broke, and the stacker swung around almost at right angles, causing the boat to take a heavy list to port. The door of the hatch was open and an obstruction prevented its immediate closing. When the boat listed to port the water poured in, and the hull was quickly filled, causing the boat to settle port side on the bed of the stream. A diver was employed to close the hatch. Then the water was pumped out and the boat righted.

The dredge is working longitudinally with the live open-water channel. The cut is 200 ft. wide, and at the side a cut 50 ft. in breadth is kept open. It is the intention, when the upper end of the ground is reached, to make the return cut alongside the present cut, leaving a second open-water course of 50 ft. adjoining the first, or a total of 100 ft.; and in the future to work the ground always up and down the living open-water channels, to the end that there may be ample channels for the flood waters, thus avoiding any complication with the débris commission, and preventing inconvenience to the ranches above and below.

In order that the channel improvement may be more conveniently accomplished, headlines are employed instead of spuds, and the general construction of the dredge is so arranged as to make it possible to stack the tailings on one side and leave the ground open at the other side. In order to provide for working the dredge close along the banks of the cut, the sluices are kept wholly on the boat, no provision being made for overhanging extensions. The assumed necessary area of 1500 sq.ft. occupied by the gold-saving tables is provided by placing the pumps below decks and the winch on the upper deck at the stern.

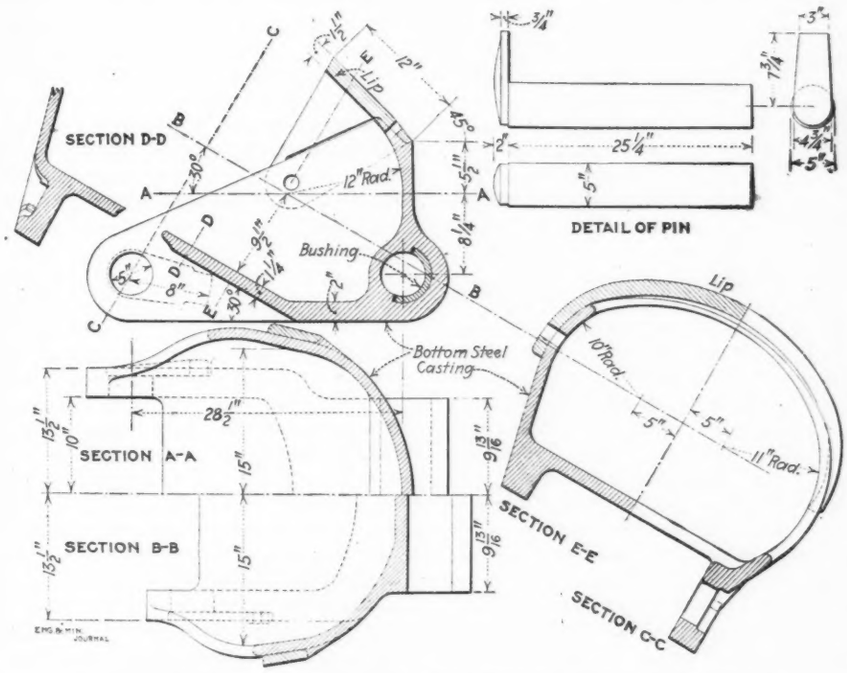
Hull Reinforced by Steel Girders

The hull is 85 ft. long, 37 ft. wide, 7 ft. deep, 5-ft. draft; the height of the boat over all from the main deck to the top of the stern gantry is 37 ft. The hull is reinforced at bow and stern with steel-plate girders extending the full depth; the bow, with ⅜-in. plates and 4x6-in. channels, and the stern with ⅜-in. plates and 15-in. channels. The body of the hull structure is further strengthened with 2½-in. truss rods extending fore and aft and horizontal, provided with turnbuckles for contraction and expansion of the structure.

The 7-ft. depth of the hull is sufficient for the installation of pumps, and their position in this part of the boat eliminates the priming of the pumps. There are two 8-in. Ragen 20-ft. lift pumps for supplying water to the gold-saving tables, and one 8-in. Krogh 55-ft. lift pump for supplying water to the revolving screen operated by 30-hp. motors under 2200 volts. The suction screen for the low-pressure pump is at the end of the well and so arranged that gravel which misses the regular save-all will pass over the pump screen. Examination of the gravel found in the distributing pipes has shown the presence of gold, thus indicating an appreciable saving through this arrangement.

The digging ladder is 62 ft. long, equipped with fifty-nine 4-cu.ft. close-connected buckets, digging 27 ft. and carrying an excess of rated capacity, and dumping 25 per min. The ladder is girder-trussed with angles; the upper parts of four 15-in. channels with two 1x15-in. plates between channels. The return sluice plate ½ in. thick is supported by heavy transverse angles. The top of the channels is further stayed from transverse flection by plates and angles with open spaces between them to admit of the ladder rollers turning. The ladder rollers are cast steel, the roller body and journal in one piece. The bushings are cast iron with ball-and-socket supports of cast steel. There are 11 rollers placed at intervals of five feet.

The ladder support or hanger is an inverted U- or horseshoe-shaped steel casting six feet long from the outer side of the curve to the ends of the stems. The opening between the stems is just sufficient for the buckets to pass. This construction renders it impossible for the buckets to go clear off the lower tumbler, as they will engage the hanger and be brought to a gradual stop, as the hanger will be deflected somewhat before it comes to a position in which it can effect the stopping of the bucket line. This construction affords also a ready method for putting the buckets back in place, as by reversing the line the buckets are directed toward the center of the tumbler. The ladder fork is of solid steel casting, with the lower-tumbler bearings swiveled at the extremities. The bearings are provided with packing glands to exclude grit. The journals are 12 in. in diameter and 16 in. long. The lower tumbler is six-sided, cast in one piece of high-carbon steel, the treads and corner plates are of manganese steel 2½ in. thick, riveted to the main casting.



Details of 4-cu.ft. Bucket on Wade Dredge, Butte Creek, Calif.

Upper Tumbler and Shaft in One Piece

The upper tumbler is four-sided, cast in one piece of high-carbon steel, provided with projections or sprockets lined with manganese-steel plates, 2½ in. thick, for supporting the bucket under the front and back eyes. The journals are 16 in. in diameter and 20 in. long. The tumbler is driven by a single gear. The housings for the top tumbler bearings, hanger shaft and intermediate shaft are steel castings extending the full length. The ladder is supported by a steel shaft 10 in. square. The tumbler stands 22 ft. above the water level. Casting the tumbler and shaft in one piece reduces the weight and makes a saving in the first cost, and avoids the possibility of the shaft working loose. In case of a broken shaft a new tumbler can be supplied at no greater cost than the taking out of the old and putting in a new shaft.

The upper tumbler supports the buckets only under the front and back eyes; the lower tumbler, being six-sided and without sprockets, supports the buckets only through the middle; this gives more uniform travel to the bucket line, and

distributes the wearing action of the two tumblers, tending to wear the bucket bottom uniformly. This method of distributing the wear, causing regular and uniform movement of the buckets over the ladder rollers, tends also to distribute the wear uniformly on the sides of the buckets.

There is no rolling or sliding of the buckets on the tumblers to cause excessive wear of the bucket bottoms and the tumbler treads. General gold-dredge practice has demonstrated that this wear is due primarily and almost exclusively to the sliding motion between the bucket and the tread, and not to impact. The four-sided tumbler gives the most abrupt dumping action to the bucket; when provided with sprockets it also eliminates the sliding motion. In dumping, the bucket being concave or rounded in form, the gravel clears from the bottom and sides with a single motion of the bucket instead of sliding away as with the six-sided tumbler and the hood- or hopper-shaped bucket.

Two new tumblers, one upper and one lower, have replaced those originally built with the dredge. The present lower tumbler has been in use about six months, and the bearings show little wear. New tread plates were placed on the upper tumbler in October. A good record has been made in the operation of the ladder rollers. The bearings have been in use for 15 months. Two or three months ago these bearings were taken off and the mark of the lathe tool was still discernible. The average wear on the lower tumbler shafts has been about ⅛ in., from a diameter of 14 inches.

Buckets of 4-cu.ft. Capacity

The buckets were designed to carry four cubic feet of gravel, and in actual practice uniformly carry an excess of rated capacity. They are close-connected, two-lug type. The body, including hood and bottom, is cast in one piece of 60-point carbon steel, weighing approximately 1100 lb.; the lip is cast of manganese steel, weighing 130 lb.; the bushings of manganese steel weighing 30 lb.; total approximate weight 1385 lb., or a maximum of 1400 lb. The dimensions are: Width, 32 in. at center, 26 in. at bottom; height 24 in.; depth 30 in.; pitch 28 in. The bucket has greater width of mouth, hood and bottom and less depth than the standard California-type bucket, and is concave or rounded.

The lip approximates the arc of a circle and is tilted backward at greater pitch than is common to the standard type. As a whole it conforms more to the design of the bucket of El Oro dredge No. 1 operating in the Oroville field than to any other. Briefly it may be described as a short and round bucket. Measurements were made after the dredge had been in operation for seven months, showing that the outer edge of the lip had worn less than one inch, and the inner edge less than ½ in.; and that the variance of wear measured at three points, the center and sides, did not exceed ⅛ in. In the casting the outer edge of the lip projects at a sharp angle. The wear has cut this down to a bevel. The bottom and sides of the buckets also show uniformity of wear, and no evidence of gouging in spots from impact with the tumblers. After the dredge had been in operation for 15 months, I made further measurement of the same buckets and found that the wear on the lips had increased about ¾ in., making a total wear in 15 months' actual work of about 1¼ in. on the outer edge. The variance of wear was about equal to that shown by former measurement. The bottom and sides of the buckets likewise showed uniformity of wear and no gouged spots.

High Speed of Bucket Line

The estimated weight of the loaded buckets is approximately one ton each, and the ladder 50 tons; a total weight of ladder and 59 loaded buckets of 109 tons. The results of the motor show, notwithstanding the high speed of the bucket line, that the increased strain is light and more than offset by certain advantages, including the uniform travel of the bucket line. There is no thumping or jarring of the boat caused by the buckets on the tumblers, but a rise and fall in sound, a trace of noise in the gears as the bucket gets to a flat position. The entire action of the dredge is smooth and uniform, which in part may be accounted for by the reinforcement and strengthening of the hull and the thorough trussing of the superstructure, rendering the boat less liable to the effect of any jarring motion of the machinery. There is no appreciable evidence of jarring, nor is there extreme pitching resulting from digging at different depths. The dimensions of the structure and the arrangement of machinery combine to eliminate ordinary disturbance common to boats improperly constructed.

The dredge was operated continuously for five months without a break in the bucket line. Then within a few days two buckets were broken by an incompetent winchman getting the bucket line off the lower tumbler, and not understanding either the necessity for reversing the travel, or the cause of the trouble, resulting in one bucket being jammed and broken between the hanger and the bottom of the tumbler. Thus the inverted U devised for the purpose of preventing the bucket line from going clear off the ladder proved the theory of its construction and application, and would not have caused the breaking of the buckets had proper caution been used. Another bucket was afterward taken off the line because of a crack in the body, occasioned in the same way, the lip being placed on a new bucket. Three more buckets have since been broken, making a total of five broken buckets in 15 months' actual running time. No lips have been broken nor worn out. The five lips taken from the broken buckets have been placed on new buckets.

The revolving screen is five feet inside diameter, 32 ft. long, placed at a grade of two inches to one foot; the perforation surface of the screen is 24 ft. long; the perforations are ⅝ in. The gravel is washed with nozzles 1½ in. diameter, five at the lower and three at the upper end. The gold-saving tables are the cross system, a liberal modification of the standard longitudinal type, having an area of 1500 square feet.

Conveyor-belt Stacker

The stacking ladder is 76 ft. long equipped with a 30-in. belt, guarded by a canvas trough; this trough prevents the heavier rocks from bounding off the belt. A simple device is employed for protecting the belt and the trough from the heaviest rocks that pass through the screen. This is a small wooden frame constructed of three pieces of 2x4-in. board placed parallel and fastened near the ends with cross pieces, to be put on the belt by a deckhand at signal from the winchman in time to catch the extra-heavy rock and carry it free of the belt to the end of the ladder. The deckhand follows along on the gangplank, and recovers the frame by holding on to the rope attached to it. Thus the rock is disposed of without coming into direct contact with the belt or the trough. Rocks of 36 in. or larger are taken off the bucket at the bow of the boat, necessitating the stopping of bucket line, as is the case in general practice in handling extraordinary rocks.

Electric power is furnished by the Sacramento Valley Power Co. over a pole line, a distance of about 100 miles. All motors are operated under 2200 volts, are direct- or belt-connected, having a total of 225 hp. distributed as follows: Digging ladder 75 hp., conveyor 30 hp., winch 30 hp., screen 30 hp., variable speed: pumps, (two) 30 hp. each. The motors are Westinghouse type.

The rated yardage capacity of the dredge under favorable conditions is 3000 to 3500 cu.yd. of gravel per 24 hr., approximately 100,000 cu.yd. per month. The actual average result in the 15 months has been about 70,000 cu.yd. per month. Under favorable conditions the average has run as high as 82,000 cubic yards.

The superstructure consists of four longitudinal 15-in. channels, each having two girders; each panel is secured from fore-and-aft strains by four 2½-in. rod trusses fore and aft extending from the bow gantry to the stern gantry and with

transverse truss rods of the same dimensions; the posts are wood. The winch drums and gearing are supported by structural-steel bedplate extending the full width of the dredge, and resting on a steel stern girder.

The construction of the dredge was practically all done, with the exception, of course, of the pumps, motors, etc., in a temporary shop built at one end of the dredge pit. Here the tumblers, rollers, ladder forks, hoisting shaft, buckets, etc., were machined from the rough material and castings. The structural portions were built here from the rough structural steel. The ladders, girders and such parts as required assembling were assembled and riveted on low trucks run on tracks extending through the end of the shop and into the pit; when completed they were carried on the same trucks to the places where they were built into the hull of the boat, and where necessary, as in the placing of the ladders, the tracks were run up on the hull; the trucks carrying the ladders were drawn into position from which the ladders were lifted to their places in the dredge.

The same shop is still conducted as a general machine and repair shop. At the time of my visit a new upper tumbler and a new lower tumbler were being constructed, buckets were being machined and the lips riveted to the bodies of new buckets, to meet emergencies and thus avoid delays in case of the breaking of a tumbler shaft or the cracking of a bucket. The further purpose of this preparation of new tumblers and buckets is in anticipation that the life of the various parts of the bucket line will be approximately equal, and that the lip of the bucket will equal the body in service. It is probably too early in the life of the dredge to form an opinion, but the indications apparent from the even wear of the various parts are that, barring breakage, the entire bucket line will require rebuilding at one time.

Stratton's Independence

The report of Stratton's Independence, Ltd., for the year ended June 30, 1912, shows that 31,515 tons of ore were mined, having a gross value of $573,205, and a net value of $398,465. The lessees' output was much less than the previous year, while the production on company account exceeded any previous year since the leasing system was established. The net profit for the year's operations was £27,465, out of which two 10% dividends, or £25,000, were paid.

The production from the Washington claim showed a substantial increase over the two previous years, due to a rich strike on the 900-ft. level. On Sept. 16, the water had receded so as to expose the workings down to the 1150-ft. level, after a submergence of eight years. It is proposed to crosscut for the Washington vein immediately in the hope of opening payable ground at that depth. About 80% of the total production was from the Independence claim. A large increase in the production is anticipated by stoping out such mineralized ground as will exceed $2.50 per ton; previous experience warrants the expectation of encountering occasional bunches of high-grade ore.

The mill treated 112,392 tons of ore, averaging $3.10 per ton, at a cost of $1.27 per ton. Of this amount, 13,019 tons were from the mine and the rest from the dump. An extraction of 73.63% was obtained; 42.19% by concentration and 31.44% by cyanidation. The mill was forced to suspend operations from Dec. 22 to Jan. 17, because of freezing of the water supply.

Trail Location and Construction*.

The first and most important consideration in trail construction is always the location, and grade is the determining factor in location. Where it is steep, switchbacks should be resorted to. The methods used in location are: (1) Compass and Abney hand level (accurate); (2) hand level only (fairly accurate), and (3) ocular leveling (inaccurate).

A route should first be reconnoitered and definitely decided upon before it is staked out. The main points can be sketched in on a map by means of a compass and hand level. On short distances the hand level will be sufficient. Laying out by eye is a poor method and inaccurate at its best. The route should be staked every 50 to 100 ft. and blazed, but as a usual thing routes are laid out by blazing only. The blazes should be made close together along the trail so that there will never be any trouble in following them. Location should always be from the top of a hill to the bottom, otherwise the maximum grade is apt to be exceeded, because in locating from the bottom there is danger of making the grade steeper than necessary. Location work can be done with a crew of three men and costs from $2 to $10 per mile.

There are several choices for trail routes: (1), Valley or cañon; (2), ridge route; (3), trails crossing mountains, and (4), foothill. The use of one of the first two routes depends somewhat on the nature of the country. Where the cañons are extremely steep, narrow, and full of boxes or interrupted by cliffs, the ridges and sidehills can be followed without much trouble. For the latter, the south sidehills should be used, because they are passable three weeks earlier in spring and later in autumn than north hillsides. Where the country has been worn down the valleys have a gentle grade and are fairly wide, so that they make good trail routes. Routes crossing the mountains are usually expensive and contain steep grades. Foothill routes are undesirable, because there is so much winding in and out of the heads of cañons, to keep an even grade, that the trail becomes extremely long.

Factors which influence the building and cost of trails are: (1), Grade; (2), width of the cleared space and the tread; (3), nature of soil; (4), cost of labor; (5), distance for packing supplies; (6), distance men have to walk to the work; (7), cost of supplies; (8), supervision. Grade is the determining factor.

The cleared space varies from 6 to 14 ft., and the tread from 1 to 4 ft. Ordinarily a tread of 18 in. is wide enough, for a horse will almost invariably travel on the lower side of a trail and always in the same place; if the trail is wider, the inside will fill up with sliding material and the extra cost in excavation will be thrown away. On turns, trails are widened and on switchbacks the width is doubled. The trail bed should be flat. Excavation should be made into the bank instead of building up the outer side of the trail, because on steep slopes earth thrown out of the trail makes a poor footing. The supervision of the crew is a most important factor, for if the work is not arranged as it should be, the trail will be expensive under the most favorable conditions.

The size of the crews varies from 2 to 15 men. In crews of 8 to 15 men it is necessary to have a cook, a packer, and a foreman. The brushing out can be done by 2 to 4 men, while 5 to 8 can do the grading. Small crews vary from 2 to 5 men.

On side-hill locations where water will run down a trail, it is always best to put in water bars; that is, small ditches 2 to 4 in. deep, running diagonally across the trail and banked on the lower side with earth or a small log sunk a few inches in the ground. These will turn the water and prevent any great amount of washing, which might ruin a trail. The number of water bars will vary with the grade of the trail and the degree of slope of the side hill. It is much cheaper to put them in when building the trail than afterward. Under ordinary conditions they can be located from 150 to 225 ft. apart. In building a trail, the country should first be reconnoitered and the route fully decided upon. It should then be located by stakes or blazes, and cleared and brushed, after which it will be graded and the tread formed to the specified width.

*Abstract of a paper by Ernest Wohlenberg in the Forest Club Annual of the University of Nebraska, reprinted in "American Forestry," August, 1912.

The production of sand and gravel in the United States in 1911, as reported by E. F. Burchard, of the U. S. Geological Survey, amounted to 66,846,959 tons, valued at $21,158,583.

Who Is a Mining Engineer?

By Mark R. Lamb*

In this article is given a complete graphic solution for "Lamb's Formula" by which a mining engineer may determine his "Relative Location." Of the factors affecting the result, "Tact" is shown to have the greatest influence.

*Manager in South America for Allis-Chalmers Co., Santiago, Chile.

This question has been discussed exhaustively, but heretofore only as an ethical problem. I have discovered that it may be solved practically to two-decimal accuracy by the use of an easily understood diagram. Right now, before going further, it is insisted that to be entitled to consideration, any criticism of this solution or of factors or their values must be accompanied by a sworn statement that the critic has not yet determined his own Relative Location.

The Factors Needed for Solution

The purpose of the chart is to furnish a rapid solution, sufficiently accurate to be well within the limits of the observed data. The chart consists essentially of three parallel scales, one for Publicity, U; one for degree of Specialization or diffusion of efforts, S; one for Money value, D; a diagonal line graduated in Professional Associates Rating, T; and a set of curves for the various values of N, or the coefficient of friction, sometimes improperly called "luck" curves. This Tact factor N, while of course the most important, unfortunately must be assumed. It has been found best to obtain disinterested opinions from various sources and either average or integrate them.

Corresponding values for Money and for Publicity lie in a straight line through a point on the Rating diagonal where this is cut by a vertical through the interesection of the Specialization and Tact lines determined by the given conditions.

A good client of mine will serve as the subject for an example. The diagram has been so arranged that, given the necessary data, the relative location of a mining engineer can be determined in ten seconds. To make the method clear, however, it will be described in some detail. My good buyer came to Chile to examine a copper mine, bought it, promoted it, equipped it and is now manager. Plainly therefore, his value on the Specialization scale is 6. As the word "native" is frequently on his lips, his Tact factor can never by any chance be greater than 5.

Project horizontally from 6 of the Specialization scale to Tact curve 5 and thence vertically to the rating diagonal. A straight-edge connecting this point with 7 on the Publicity scale (he contributes to the JOURNAL and is writing a book on "The Aborigines as Miners") gives him a rating of 2.5 on the money scale. This is only fair and handicaps him in the final test.

His geographical position during the last five years, by semesters, was as follows: Beginning with the first semester of 1908 his record on the "G" table appears as a broken line through the points 2, 2, 4, 8, 9, 2, 2 and 2, making an average of 4.5 from which project to the small Money scale. The point of intersection on the Relative Position scale gives his standing as a mining engineer. It will be seen that his relative position is secure at 4 but how much better it would be with at least some experience in London—or with a higher Tact value.

He is an example of man whose actual earnings would entitle him to a higher position on the Money scale, except that such earnings are not as a Mining Engineer but rather as a commercial reward.

Baby's Colic as Affecting Relative Location.

Each engineer, in determining his own location, will find that some years of study and self-examination are necessary before a value for Tact can be assumed with any degree of confidence in its accuracy. Indeed, this is a very variable variable and can vary with the climate, the dinner or the baby's health.

Space forbids enlarging upon this important factor. Each would-be mining engineer can look back over his life and locate definite periods when his value for Tact was very low and changeable. Usually—though not always—he can notice a gradual increase in value.

The word-values opposite the numbers on each scale are intended only as an aid to the unimaginative. Conceivably they may be changed or interchanged, though this should be done with extreme caution. Even before this has gone to press, a noted engineer has insisted that "full-dress" and "check book" on the Money scale should be interchanged. He gives no reason, but it is perfectly plain that such a change would raise his relative position. Another engineer insists that he would travel "first class to Europe" under any circumstances. He declines to give us his factors for working out his position, but it seems certain that his experience points would be all close to the "Boston" line. Word-values may be interlined between those given on the various scales, depending upon the ideas of the engineer.

It will be noted that while the value of Money influences and in fact will usually predominate in determining the relative location of the engineer, experience and consequently knowledge has some influence. This is right. Knowledge should have some effect even though it is truly said that an engineer's progress is stopped quicker and oftener by a low value of the coefficient of Tact than by technical shortcomings.

Publicity by Technical Contributions

Values for Specialization and Publicity can be determined easily. The first is not easily changed and depends more upon outside influences than any of the others. Publicity can be changed only by the expenditure of effort continuously, though it can be gained out of office hours, on the train, during holidays and Sunday mornings by a judicious and continuous recording of experiences for the technical press.

The chart furnishes a means of determining any one of the four factors, the other three being known. This will be very useful when it is desired to find the Tact coefficient of a man, for example, who is to be employed by a stupid board of directors or in a country where the feeling against his nation is strong. The determination of this factor from testimonials or even from preliminary interviews is misleading. This is because, however variable its value, Tact is always under the absolute control of the engineer *whenever he sees fit to exercise control.* His prospective employer wishes to know its *average* value.

The range of values on the several scales covers all but the most extraordinary conditions. The graduations on the Money scale range from "private car" to "visiting wife's folks". This will include 99.9% of the readers of the JOURNAL.

The Specialization scale provides for any possible condition, as is proven by the terms describing the two extremes. It is perhaps well to forestall possible impulsive and unthoughtout criticism of this scale by explaining that while a diversified or dispersed experience increases a man's value as a manager or editor, it does not *per se* increase his value as a mining engineer.

The Publicity scale ranges from utter obscurity as described by the words "secretive of data" to "featured in the Satur-

day Evening Post." These are certainly the limits of terrestrial publicity. Two years have been spent by the writer in the study of the values for the Publicity scale. Therefore, though this factor may seem to have been given undue importance, it should be accepted with entire confidence.

It is understood of course that only desirable publicity is available as a factor. In one of the early attempts to arrange the diagram, the publicity scale included minus quantities. The minus portion of this scale is useless, however, since no degree of Specialization could raise an engineer's value above zero, if his Publicity rating were below zero. It is hardly necessary to say that a high value for Tact is incompatible with a low Publicity.

There is no royal road to desirable publicity. Neither can it be purchased. An engineer I know has a standing offer with the editors to buy all the desirable publicity they can furnish. He also has a reward standing for a practical, effective scheme for professional advertising.

There is another point to be taken into consideration in choosing a value for the Publicity factor. An engineer may today enjoy a high degree of desirable publicity and tomorrow, through having detached more than his dentist has equipped him for, suffer with an equally large factor of publicity of opposite sign. The desired value in such case is obtained simply by adding the plus and minus quantities.

Tact the Important Factor.

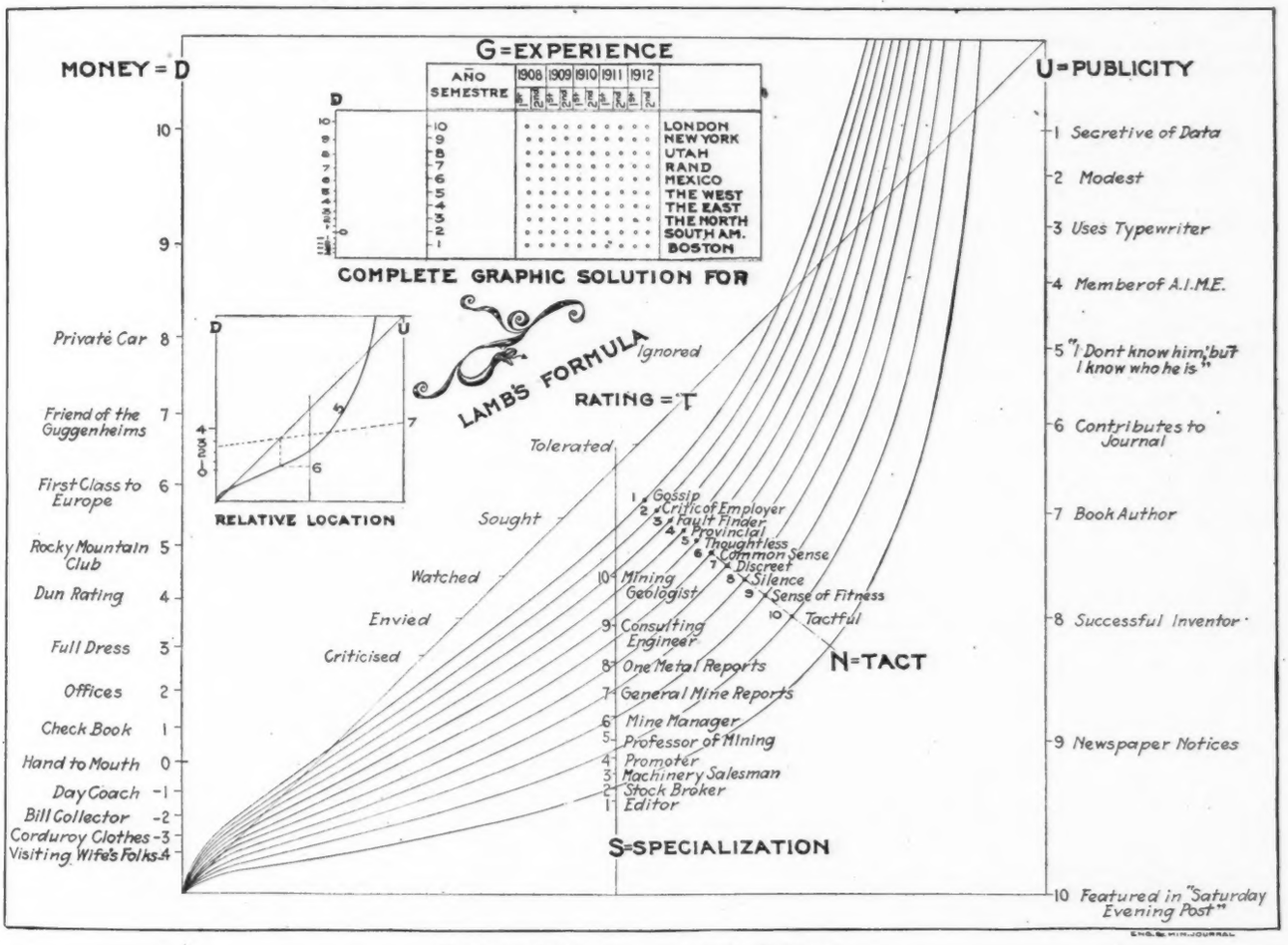
The Tact curves cover all the values obtainable from such noted authorities as Socrates, Marcus Aurelius, Æsop, Solomon, Lord Chesterfield, Uncle Remus and Uncle Charley. The coefficient for Tact is of course the most influential. Except for the effect of the title of this article upon the value of my own Publicity factor, it would have been called the solution of the Tact formula.

The Money scale, or the man's monetary value as a mining engineer (upon which the results are usually sought) with reasonable care in reading will give results to within two or three units in the second significant figure, an accuracy well within that of the original data. With Specialization and Publicity factors unvarying, an engineer will find his Money value shift frequently from "full dress" to "check book." "Office" is the critical point with many engineers. It is a point reached several times before it is passed permanently. This fluctuation is caused by variations in the value for Tact.

The study upon which this solution is based has been laborious, extending over many years and involving the painstaking accumulation and correlation of data. It is based upon strictly scientific and accepted theorems and I trust that my own life line will not be thought to have influenced the final diagram.

What Not to Say and When

Many lessons can be gathered from a few searching and candid analyses of the qualifications of one's friends. For example, if my client above mentioned had a publicity rating of only 4 or 3 his Money value would be very low. Even with a protracted London experience, he could not attain a good relative location as a mining engineer. To be sure, he could raise his Tact factor, but he will not—he is too old. A man entitled to Tact curve 7 or 8 will rarely find use for the words "Englishman," "American" or "native" in ordinary conversation. If he must know your nationality he will say, "What is your native city?" rather than "Do you speak English?"



Graphic Solution for Lamb's Formula

Much (Allis-Chalmers Co's.) time has been spent in preparing this. If it has been the means of calling your attention to the low average value of your Tact coefficient, your employer's sighs of relief will amply reward me. In order to obtain the best results from the use of the diagram it should be used frequently and should be kept handy. This advice is particularly for the younger men. They can learn and change, whereas the old men are bunkered.

The graph accompanying this contribution (like that accompanying "Curves of Comfort" in the *Mining and Scientific Press,* Aug. 27, 1910) has been drawn life size with instrumental accuracy. It is certain to lose in clearness when reduced for publication. A limited number of signed proofs, full scale, may be obtained from the author. These are mounted on art parchment and are in every way suitable for use in private practice.

Crown Mines, Limited

JOHANNESBURG CORRESPONDENCE

The Crown Mines, Ltd., has successfully issued one million pounds of 5% debentures to pay off the balance of a total of £1,546,103 spent on capital account since the formation of this company by the amalgamation of a large number of mines on the Central Rand. This large sum, considering the tonnage of 36,000,000 tons in the upper known portions of the mine which will be affected by the work, has been wisely spent. It represents less than 6d. per ton on this total.

The design has been to concentrate the work of hoisting 220,000 tons per month on the two main seven-compartment shafts, or, if necessary, on one, instead of using 11 shafts as before. The whole mine is nearly three miles long, and underground the ore is concentrated on these shafts by main-haulage levels, one of which, on the 13th level, is now two miles long. It is 15x9 ft., equipped by electric haulage.

The two main shafts are so arranged that practically all the ore in the deeper portions of the mine will be raised to them by subsidiary inclines. They are equipped with 10-ton skips, and their hoisting capacity is 5000 tons in eight hours. They have been provided with immense sorting and crushing stations of reinforced concrete and connected to the three main milling plants by a railway system. Should one shaft be hung up, all the ore underground can be sent to one shaft and distributed on the surface to all the mills.

The ore reserves since the amalgamation in July, 1909, have been increased from 4,000,000 tons to 10,000,000 tons. Workshops have been centralized, the whole plant electrified and reduction capacity increased from 150,000 tons per month to 220,000 tons per month. A further capital expenditure of £150,000 will be required to complete the work in hand for mining the area containing 36,000,000 tons now being attacked. In July last, 166,000 tons were milled for a working profit of £118,825. Some short fall in grade and tonnage is expected for the first few months of working the new scheme, but with sufficient labor there are enough faces available to treat 220,000 tons per month.

Sulphatizing Roasting of Copper Ores

A paper, by Utley Wedge, before the International Congress of Applied Chemistry, described the sulphatizing roasting of copper ore and concentrates in the Wedge furnace. Mr. Wedge described some of the conditions under which smelting became unprofitable, where fluxing material, or fuel, is scarce, and thought that sulphatizing roasting with subsequent wet recovery of the copper might offer a way out.

Theoretically one part of copper requires one-half part of sulphur for sulphatization, but practically an excess must be present. This may be added as sulphur, SO_2, SO_3, H_2SO_4, or in the form of some sulphide or sulphate. Iron sulphide is a desirable addition agent for sulphatizing; zinc, lead, lime and magnesia, if in forms which may take up sulphur, are undesirable.

The chief reactions entering into sulphatization are:

Above 350° C., $2CuS = Cu_2S + S$, followed by $S + 2O = SO_2$.

Above 350° C., below 500° C., $2Cu_2S + 5O_2 = 2CuO + 2CuSO_4$.

Above 500° C., $Cu_2S + 2O_2 = 2CuO + SO_2$.

Different copper sulphides behave differently at the various temperatures, but the common tendency is to form some copper oxide at all furnace temperatures, and in the attempt to secure the highest percentage of water-soluble copper, the constant formation of copper oxide is the chief obstacle to be overcome.

The presence of iron sulphide assists in sulphatizing the copper oxide thus formed. At furnace temperatures below 600° C, there is some basic sulphate of iron formed, which, at temperatures above 530° C. roasts to form Fe_2O_3 and SO_3, and the SO_3 may combine with the CuO to form $CuSO_4$, which is stable below 650° C., or CuO may react directly with $Fe_2(SO_4)_3$,

$3\,CuO + Fe_2(SO_4)_3 = 3\,CuSO_4 + Fe_2O_3$

Even the Fe_2O_3 is of some assistance in sulphatizing the CuO, for between 500° C. and 750° C. the iron oxide is a vigorous catalyzer for the production of SO_3 from SO_2. The following tests were made in a Wedge multiple-hearth furnace on a chalcopyrite, pyrite and pyrrhotite ore, no extraneous material being added. The ore carried: Cu, 1.07%; Fe, 49.25%; S, 32.6; SiO_2, 6.8; MgO, 2.18; Al_2O_3, 1.59%. The results showed: Water-soluble copper, 0.35% = 27.8% extraction; acid-soluble, 0.80% = 63.4% extraction; insoluble, 0.11%; total, 1.26% and 91.2% extraction. The calcined material carried 4.7% S and was reroasted in a Wedge multiple-hearth mechanical muffle furnace. The results then showed: Water-soluble copper, 0.76% = 60.3% extraction; acid-soluble, 0.48% = 38.1% extraction; insoluble, 0.02%; total, 1.26% and 98.4% extraction. The acid-soluble is the portion which can be leached by dilute sulphuric acid.

Another ore was treated in a 9-ft. 9-in., Wedge, five-hearth muffle furnace. It was a chalcopyrite, with a diabase gangue. It carried: Cu, 4.38%; Fe, 9.61; S, 16.37; CaO, 1.01; MgO, 0.72; insol., 61.21. Actual leaching of the copper in the ore gave: Water soluble, 73.7%; acid soluble, 15.7%; total extraction, 89.4%. If the copper is recovered by electrolysis, there is ample acid regenerated to leach out the acid-soluble copper.

Another ore was ground to 20-mesh and given a single treatment in a small test furnace, showing: Water-soluble copper, 80.80%; asid-soluble, 11.8%; which results were afterward duplicated in a Wedge 20-ft. furnace.

Another furnace test on a copper-nickel ore showed: Water-soluble, 69.2% Cu, 13.6% Ni; acid-soluble, 12.8% Cu, 4.4% Ni. Another ore contained copper chiefly as silicate. The ore ran: Cu, 1.86%; Fe, 2.79; S, 0.80; Al_2O_3, 2.58; insol., 88.3; comb. H_2O, 3.4%. The sulphur in the ore seemed to be partly in cinders from the locomotive, which had accumulated *en route* from the West. Six per cent. of pyrites was added, and the mixture treated in a five-hearth muffle-fired furnace. After leaving the first hearth, 79.3% of the copper was soluble; after leaving the second hearth, 81.4; third hearth, 93.4; fourth hearth, 95.2; fifth hearth, 95.2%. A bornite ore after roasting gave 92.6% water- and acid-soluble copper. This ore carried 63% SiO_2.

It is Mr. Wedge's opinion that work with his furnaces indicates the possibility of displacing smelting in special cases.

According to the U. S. Geological Survey there were 27,703,644 tons of coke produced in beehive ovens in 1911, as compared with 34,570,076 tons in 1910, while there were 7,847,845 tons of coke produced in retort ovens in 1911, as compared by 6,866,432 tons in 1910. At the close of 1911 there were 2254 new ovens in course of construction of which 698 were byproduct ovens.

Mining Methods at Kimberley—II

By John T. Fuller*

The features of the Kimberley system of stoping are vertical stope walls, pole roads and back pillars. The Dutoitspan system contains features of both the De Beers and Kimberley methods. Water tunnels have practically eliminated the occurrence of mud rushes.

*Consulting engineer, Honesdale, Penn.; formerly manager of the Dutoitspan diamond mine.

The features of the Kimberley stoping system are vertical stope walls, the use of pole roads, and after the first stope against the rock has been put up, the use of a "back pillar" to keep back the reef in each succeeding stope, as shown in Figs. 20 to 31. A stope is started exactly as in the DeBeers system by connecting the ends of the 22½-ft. center tunnels and forming a long gallery, Fig. 20. As soon as the gallery is completed the proposed length of the stope, the roof is attacked and the stope carried vertically upward to the broken material 40 ft. above, sufficient broken blue always being left in the stope to enable the miners standing thereon to drill the roof.

Two offsets or tunnels, preferably the ones second from the ends of the stope Fig. 23, are cut out for pole roads. This is done by cutting back these two offsets about three feet beyond the stope line roughly in the shape of a semicircle. Across this opening poles eight to 14 ft. long and averaging about six inches in diameter are placed and wedged into position by cutting hitches in the sides of the stope and piling the broken blue behind them. The poles are spaced from one to four feet apart, depending on their position, whether near the bottom or near the top of the stope. The space between the poles is filled in with short pieces of old rails and lagging boards. The poles are sometimes staggered especially near the bottom, see details Figs. 45 and 46. As the stope gains in height the pole roads are kept even with the surface of the broken ground in the stope and become the sole means of entrance and ventilation. If the stope is long it is advisable to have a third pole road near the middle of the stope as an additional means of escape should it become necessary to abandon the stope in a hurry.

Stopes Maintained at Uniform Height

It is highly important both in the DeBeers and Kimberley systems to maintain the stopes at an equal height throughout their length, otherwise there is a possibility of temporarily loosing portions of the stope and of choking, with attendant delay. The same conditions prevail and must be considered with regard to the final bringing in of the stope as in the DeBeers system. When a stope is completed the bottom poles of the pole roads are blasted and the stope loaded out. Some of the poles and most of the lagging and rails are recovered for future use during the loading.

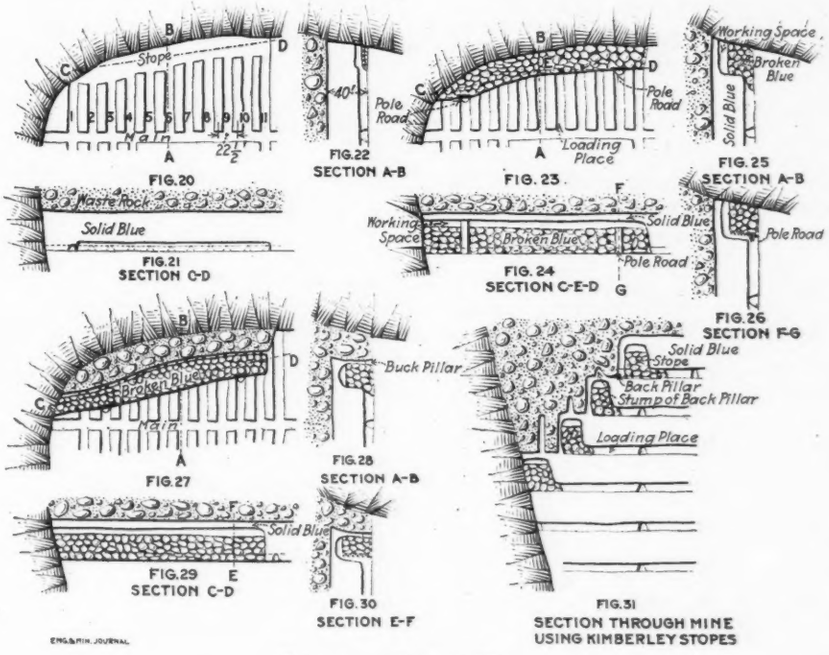
In putting up the second stopes from the rock and each succeeding stope, the Kimberley system differs most radically from the original DeBeers system. Instead of starting immediately in front of the old stope, a 6- to 12-ft. pillar known as the back pillar is left and the stope carried up as before (Figs. 27, 28, 29 and 30). As the top of the stope is approached the back pillar is thinned down and if the stope is to be brought in the final round of holes is so placed as to shatter both the roof and the top of the back pillar.

Purpose of Back Pillars Twofold.

The reason for leaving this back pillar is twofold, first to hold back and prevent an inrush of waste rock from the old filled stope behind and second to support the overhanging lip or back of blue above until such time as it is safe and advisable to relieve it of such support. The ideal section for a back pillar if it could be formed is probably as shown at *a*, Fig. 41. This shape is of course a practical impossibility. The pillar as actually formed approaches a pyramid in section *b*, Fig. 41 with a heavy base and gradually thinning down to a point as the top is reached.

The average condition of the back pillar after the final blast has been put in is shown in Fig. 42. As the broken blue is loaded out thus relieving the pillar of its side support the force of the waste behind will tend to crush and thrust forward the remainder. In any case there is bound to be a stump of the pillar left behind. The height of this stump will depend on the thickness of the pillar and the force exerted by the waste. The stump may be recovered in two ways, either by "timbering in" or from the level below.

It sometimes happens, especially in DeBeers and Kimberley mines after a stope is brought in and before it can be completely loaded out, a rush of reef will cut off the broken blue remaining in the stope from the loading place (See Fig. 43). When this occurs one of three methods may be employed for the recovery of the covered blue. The reef may be loaded out and dumped in a special pass provided for that purpose from whence it is taken and hoisted to the surface and disposed of; or if the



Kimberley Stoping System

amount of reef proves excessive the stope may be abandoned and the blue recovered from below, or timbering in may be resorted to.

Buried Blue Ground Recovered by Timbering In

Timbering in consists of placing sets, composed of a cap and two posts, skin to skin by means of a fore-poleing process through the reef until the blue is again reached (See Fig. 44). The timbering is started well back in the tunnel and thoroughly braced and may be continued through to the back pillar which is then blasted and loaded out. After the blue has been recovered the timbers are gradually withdrawn by blasting the caps, sometimes both caps and posts must be blasted, but as a rule a fair proportion of the posts are recovered for use. The other details of stoping such as drilling, blasting, loading etc., are identical with those described under the DeBeers system. A section through a mine using the Kimberley stopes is shown in Fig. 31. It will be noted that the stopes from the levels below are so located as to come up under the back pillar stumps of the abandoned stopes above. As in the DeBeers system the stope interval must be carefully maintained.

The opening up of the Dutoitspan mine for undergound work introduced many conditions that had not been met before in underground diamond mining. To begin with, compared with the DeBeers and Kimberley mines, this mine is enormous. Some idea of this may be gained by stating that in 1907 it was estimated that there were in sight between the 350- and 750-ft. levels of Dutoitspan, a vertical distance of only 400 ft., not less than 29,446,000 loads of blue ground while in Kimberley mine at the same date between the 2160- and 2520-ft. levels, a vertical distance of 360 ft., there were but 876,000 loads.[1] Dutoitspan is practically two mines connected by a neck of barren ground and is in the shape of a flat V.

Original Kimberley Stoping System not Satisfactory at Dutoitspan

The first stoping system used at this mine was the Kimberley including all of its features. When I was appointed manager of this mine it had been for some time evident that among other things there was something wrong with this system of stoping for so large an area. Briefly summed the disadvantages were:

(1) The great length of the stopes anywhere from 250 to 400 ft. made caving and crushing in of the long backs a dangerous and difficult feature to handle as the stope gained height.

[1]De Beers annual report.

(2) That in this system it is imperative that the stope be maintained at a practically even height throughout its length. This proved an exceedingly difficult thing, the miners being unable to gage the roof properly over such long distances, while premature caving, especially at the middle, frequently cut the stopes in two interrupting the ventilation and causing long and costly delays.

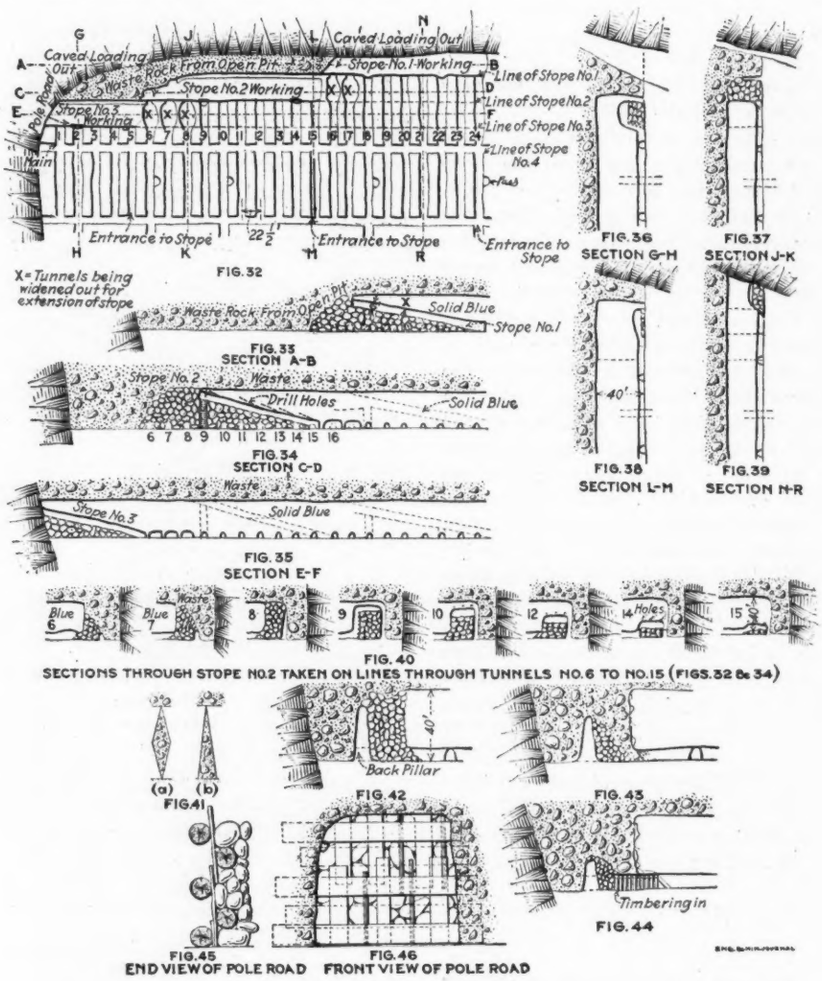
(3) The pole roads did not provide sufficient ventilation for these long stopes.

(4) As a stope under the Kimberley system must be brought in and completely loaded out, throughout its entire length, before a second stope can be started in front, considerable fluctuation is caused from time to time in the tonnage obtainable from a given level. Thus while a stope is going up, the only tonnage obtainable is the surplus not required as a platform in the stopes, this is always a variable quantity from shift to shift. After a stope is brought in there will be a rush of tonnage until it is loaded out when it drops back practically to zero while another stope is started.

(5) The government mine inspector was getting so nervous that he would not risk much more of his person than his nose in a stope and would often order the manager to take the men out.

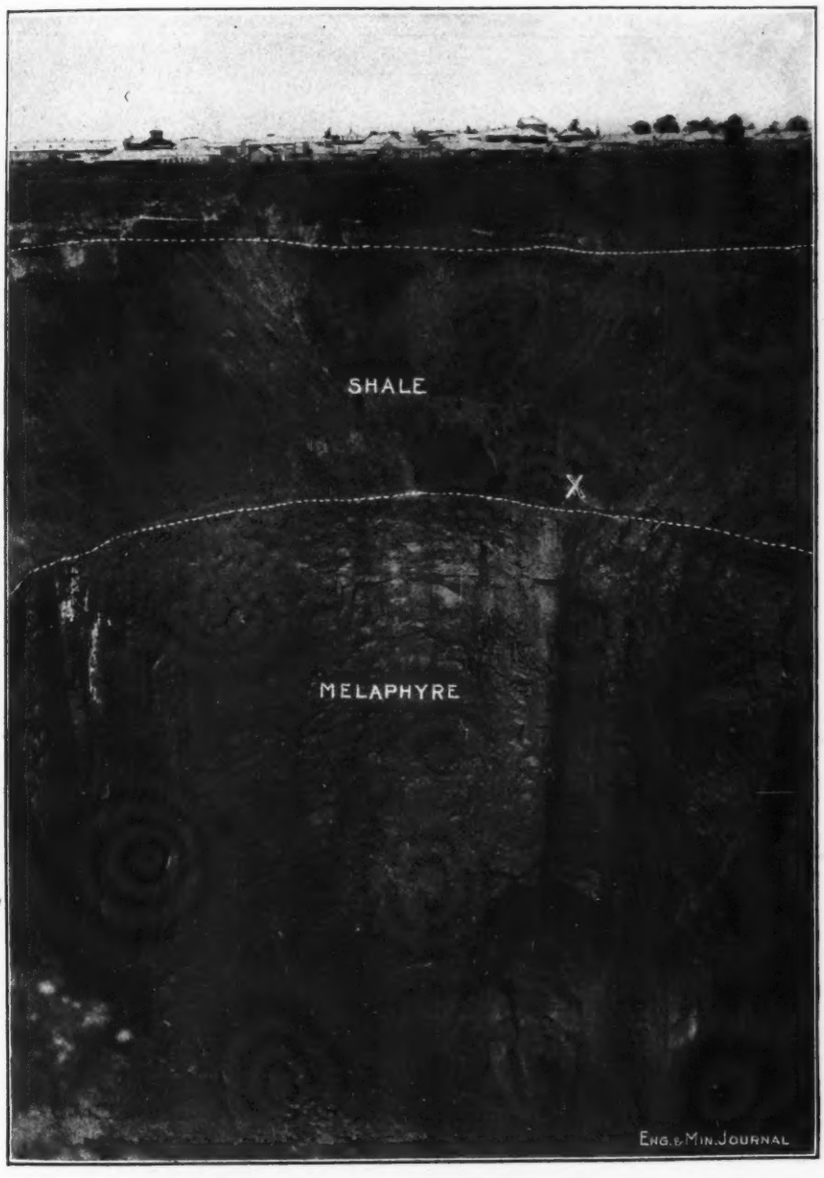
Dutoitspan System a Modification of Other Methods.

After a thorough study of the situation and a number of experiments L. P. DeCastle, the assistant manager, and I finally evolved the system shown in Figs. 32 to 40. In working out the details of the system material assistance was given by the men and sub-bosses by their hearty cooperation and valuable suggestions. A careful inspection of the drawings will show that we simply borrowed the features of the long-established DeBeers and Kimberley systems and shifted them about in a new combination to fit our particular needs. Thus the long inclined back of the DeBeers system is shifted around until the inclination is parallel to the long axis of the stope instead of the short axis; this gives the strength required to resist premature caving. The back pillar and pole



Dutoitspan Stoping System

road are borrowed from the Kimberley system. A stope is started precisely as in the two systems described except that one end is carried up more rapidly than the other until an inclined back having an inclination, Fig. 33, of from 10° to 15° has been formed. As the stope gains in height it is extended in length, thus maintaining the inclination constant. A pole road is started at the second or third tunnel from the high end and as the stope extends in length other pole roads



KIMBERLEY OPEN PIT—WATER TUNNEL AT X

are put up at four or five tunnel intervals.

It will be seen that as a stope progressed it exhibited all three conditions of "working," "loading out," and "abandoned," long before it reached the end of the line at the opposite side of the mine. It was thus possible to start a second, a third, and even at times a fourth line of stopes before the first was completed, thus maintaining a constant tonnage from a level. It was further found that the ventilation of these stopes was excellent, and that the angle of inclination was easily maintained, the miner simply having to stand at the bottom and look up at the line of lights held near the roof to obtain a clear idea of the shape of the back. This was greatly aided by the system of drilling adopted later. When a stope reaches the extreme boundary it is quickly brought in so as not to exceed over five tunnels, about 100 ft., in length, and then pushed to completion by the regular Kimberley system without delay or danger from premature caving.

While every effort is made in all stoping systems described to maintain the roof or backs at a uniform height above the broken ground in the stopes, yet they often present an irregular appearance. This is due in great part to the system of using the machine drills. A machine is set up and as many holes as possible drilled before moving; while this may be an economical procedure if properly carried out, yet it leads itself to the abuse of drilling as many holes as possible from one set up regardless of the number of holes actually necessary. If the drill runners are paid by the foot with a bonus for extra footage, this abuse is apt to occur in spite of the best supervision that can be given. The miner is apt to charge and fire all the holes drilled to cover up the bad work of the driller, with the consequent bad effect on the roof.

The miners in DeBeers and Kimberley mines are mostly experienced men who have worked in these mines since the old open-pit days and with the DeBeers company since its formation, consequently they are apt to be given great leeway in the matter of placing shots. As a result holes are put in, in all directions and at all angles, depending on the individual judgment of each miner. This practice also results in many cases of bad roof, lost ends, etc. It is true that shift bosses frequently order the direction or location of holes changed, but often they will be changed back again as soon as the boss passes on.

UNIFORM SYSTEM OF DRILLING ADOPTED

When Dutoitspan was opened however, the supply of experienced miners in this class of mining available was decidedly limited, and it was necessary to employ almost any man who offered, whether he had ever seen a mine before or not. These men had to be taught. It soon became apparent that some uniform system of drilling would have to be adopted and the following was used. The drill boys were placed three or four abreast, depending on the stope width, across the stope and drilled their holes looking up the incline. One hole being placed at each rib and one or two, as the case might be, in the space between. A second row of drillers was placed a distance in front of the first so that the openings of the second line of holes came about opposite the point where experience had shown the first line would break. In this manner the drill boys were distributed over the stope until enough had been provided to drill all the holes required to bring down an even section of roof. The holes were drilled from two feet six inches to six feet deep depending on the nature of the ground, and all were drilled in the same direction and at as near the same angle as possible. All holes were drilled with long jumpers and were self cleaning, except a few each shift in the ribs to straighten out any

projections left by previous shift, these were generally down holes using hand hammers. The pole roads were carried up by vertical holes drilled by a boy standing in the pole road and using a long jumper.

In blasting the fuses were so cut and lighted as to insure as far as possible the lines of holes going off beginning with those at the high end of the stope and working down. In special cases, such as final rounds, electric blasting was used. It soon became apparent that this system practically eliminated the uneven roofs and was a great saver of explosives. The position and direction of holes is shown in the section of Stope No. 2, Fig. 34 and in sections 10, 12, 14, and 15 of Fig. 40. When Dutoitspan was reopened in 1911 after a shutdown of over two years caused by the great slump in the diamond market in 1908, compressed air drills were introduced and whether or not the drilling system as here described is still in use is unknown to me.

Mechanical Haulage on Main Levels

The method of handling the mined blue ground is practically the same in all five mines. The blue, broken in the stopes and tunnels, is hand loaded into 16 cu.ft. capacity steel trucks and hand trammed to the nearest pass, where they are tallied and dumped. The trucks used are of two types, end tippers and side tippers; but both types are not used in the same mine as the arrangement of the pass dumps must be different for each type.

The track in the loading places and tunnels where only light traffic is handled is constructed of 16-lb. rail; that in the mains and tunnels leading to the passes of 20-lb. rail. All track throughout the mine and surface equipment is 18-in. gage spiked to wooden ties, generally of redwood. Each truck is manned by a span of two natives who both load and tram. A span of natives will load from 10 to 45 or more trucks in an eight-hour shift depending on conditions of loading place, distance from pass, nature of loading place (stope or tunnel), and the energy of the natives. This work is paid for on a bonus system, a minimum wage being paid for a certain number of loads and a bonus for each additional five loads above this number.

The blue ground dumped in the passes falls to the main hoisting level, where it is caught in special loading boxes built of timber or steel. A box of the steel type was shown in the Engineering and Mining Journal of July 15, 1911. This type of box was first designed, built and erected by L. P. De Castle and me at Dutoitspan mine. From the loading boxes the blue is loaded into 20-cu.ft. side-tipping steel trucks and transported to the main hoisting shaft by either endless-rope or electric-locomotive haulage. At the shaft the trucks are dumped into two special loading bins, each bin containing one skip load, which varies at the different mines from five to eight 20-cu.ft. trucks. The skips and shaft arrangement are of the well-known Kimberley type. On reaching the surface the skips dump into large bins in the head frame from which the blue is loaded into 20-cu.ft. trucks similar to those used below, and transported by endless rope to the depositing floors or direct to a reduction plant.

Ventilation Easily Accomplished

It has been stated by critics in enumerating the disadvantages of the Kimberley mining systems that the ventilation is complicated and difficult, while as a matter of fact it is so simple and easy of regulation that one is tempted to use the old saying, "A child can use it.' I firmly believe that the difficulty in properly ventilating most mines, other than coal mines, is generally due to financial rather than physical obstacles. With the exception of the Kimberley mine, all the mines of the group are ventilated by natural ventilation. As long as one of the mine openings is through the open pit, the general direction of ventilation is down the main hoisting shaft to the main level, from thence up through various air passes and ladderways to the working levels, from the working levels to the prospect shaft, from thence to the next prospect shaft, etc., until it finally reaches the open pit. On cold days this direction may be reversed.

When in the course of time the open pit escape must be abandoned and a second vertical shaft sunk from the surface it becomes practically necessary to install an exhaust fan at this shaft to maintain an adequate ventilating current. The Kimberley mine is ventilated by a large "Waddle" exhaust fan and the DeBeers mine has probably been provided with a fan by this time. The air current on the working levels is directed where required by means of temporary brattices and curtains, while such places as raises and high stopes where the current is either entirely absent or sluggish, are ventilated by means of small portable electric blower fans, the air being led to the face through a light galvanized pipe.

Water Tunnels Prevent Mud Rushes

The water tunnels previously referred to should really be started before the mine reaches the underground stage so that they may be ready and in operation by the time that stage is reached. The tunnels as stated are driven entirely around the crater 50 to 100 ft. back from the sides and as near as possible to the junction of the shale and melaphyre, and hence will be for some distance in the Dyka Conglomerate. It is at this horizon that the greater part of the water is encountered in these mines.

At frequent intervals side tunnels and inclines are driven to daylight about the edge of the open pit which serve the double purpose of ventilation and drainage. These side tunnels serve to lead the surface water that may flow into the open pit to the main water tunnel. A system of ditches is maintained, as far as the changing conditions will permit, along the sides of the open pit directng such water to the tunnels. Wherever a considerable stream or feeder of water is met a side tunnel, raise or incline is driven following the course of the stream until assured that the whole stream is draining into the water-tunnel system. Grouting is resorted to wherever there is danger of leaks from the main tunnels. The main tunnel surrounding the mine is graded to one point from which a direct tunnel leads to one of the main shafts where a large sump and pumping station is installed and the water pumped to the company's reservoirs for use on the floors and washing plants. The reason for all this elaborate and expensive precaution to cut off a comparatively small amount of water is to prevent the highly dangerous and disastrous "mud rushes" to which these mines are subject. These mines are not wet mines, as wet mines go. Wesselton, which is probably the wettest mine of the group, only averages about 26,000 gal. per hour. About 18,000 gal. of this is pumped from the water tunnels. As a cure for the mud rush evil the water tunnels are most successful.

Mud Rushes Now Practically Eliminated

It must be borne in mind that as the diamond-bearing rock is extracted, the open pits become gradually deeper and the only thing to prevent the open pit being as deep as the highest working level in the mine is the caving of the unsupported rock sides. The waste rock, locally called "reef" which thus falls to the bottom of the open pit, consists chiefly of the dolerite and shale, and while the open pit at Kimberley mine is at present 1000 ft. deep, there is about 1500 ft. of waste rock lying between this point and the highest working level. This mass of material exerts a tremendous pressure on the workings below. As both of the rocks forming the bulk of this waste disintegrate rapidly on exposure to the air, a high percentage of the mass will be comparatively fine material. In the case of the shale, which is generally of a bituminous nature and contains a high percentage of iron pyrites, spontaneous combustion increases

DUTOITSPAN MAIN HEADFRAME, ENDLESS-ROPE HAULAGE TO DEPOSITING FLOORS AND SURFACE BUILDINGS

LOADING STATION FOR AËRIAL GEAR—WESSELTON OPEN PIT

the disintegrative action. If water is permitted to reach this mass of material overlying the workings, it will work its way down until it encounters a comparatively impervious stratum, either on top of the blue itself or down where the material has become tightly compacted. The water will there dam back and gradually form a heavy and sticky black mud.

Conditions are now ripe for a mud rush. The first stope from the workings which breaks through under or near this mass will be suddenly and without warning flooded with mud which will pass from the stope to the rest of the workings with incredible rapidity, filling up completely hundreds of feet of tunnels and spreading death and destruction in its path. Nothing can stop this onrush until its force is spent, by which time if the reservoir was extensive, it will probably have choked up two or three levels. When the mud has finally come to rest, which is determined by the appearance of the water, there is a long, hard, and disagreeable job ahead to dig it out, rescue those who may be caught and still live, behind some barrier or stope within the mud-filled area, and recover the bodies of those who were not so fortunate. Many stories could be told of self-sacrificing heroism shown on these occasions. The Kimberley, and especially the De Beers mine, have had a number of bad mud rushes in their history, but the construction of the water tunnels have, of late years, practically eliminated this menace.

Total Recovery from 75% to 95%

It is difficult to estimate with any great degree of exactness the total recovery percentage, as may be gathered from the descriptions of the mining methods. This percentage will vary from level to level and stope to stope, thus blue which may be a total loss on one level may be entirely recovered on the next, etc. I have made many estimates extending over long periods of time and have obtained results which ranged from 100% recovery to as low as 40%. It is my opinion, however, that the average recovery from DeBeers and Kimberley mines lies between 75% and 85%, while for Wesselton, Dutoitspan and Bultfontein mines the percentage of recovery lies between 85% and 95 per cent.

Critics of the mining systems employed at these mines have been inclined to believe that the large amount of development work necessary would adversely affect the cost of mining. A few figures quoted from the DeBeers annual reports may prove interesting on this subject. For the year ended June 30, 1907, at Dutoitspan mine a total of 68,916 ft. of development work was done and 2,481,987 loads of blue mined, at a total cost per load, including mining, transporting and depositing on the floors of approximately 96½c.; of this total, approximately 55c. is chargeable to mining alone. A load weighing 1600 lb. the cost per ton for mining works out at 61 2/3 cents.

For the year ended June 30, 1911,[2] the average cost of mining and depositing for all mines was about 76c. per load, and for washing about 74c. per load, making a total cost per load of mining and milling of $1.23. When it is remembered that two of these mines are close to 3000 ft. in depth and the other three average about 1000 ft. in depth, it will be admitted that few mining companies can show such low cost records.

Reduction of Tax Valuation of Michigan Mines

Negaunee Correspondence

Considerable interest is manifested in the action of the State Tax Commission, which is reviewing the valuation of mines and general property. Local assessors this year lowered the valuations put upon the mines a year ago by the Finlay report, giving as reasons that the ore reserves have been diminished by one year's mining, and that the price of ore is now much lower than Mr. Finlay calculated in his estimates. The Tax Commission has allowed this reduction, but has found enough new mines and developments to keep the total from lowering. The following is an official statement by the Secretary of the Tax Commission regarding the valuations in the Iron River and Crystal Falls districts:

"The net result of the tax commission's reviews of the Iron County mine values for the year 1912, has been to add 3½% to the mine valuations. Last year's values were $15,101,300; this year's values are $15,622,664, or an increase of $521,364.

"During the spring the local township and village boards had reduced the total mine valuation by $463,636. The tax commission's figures restore the reduction and add $521,364 more.

"The mine valuations were reduced by the value of the ore mined for the year, except where development had kept up with shipments. It is clear, therefore, that this increase in mine values is due to new development and exploration. When it is remembered that this has been a year of low prices and that development has in many cases been held back to an unusual extent by the recent increase in taxes, it is probable that other years will see a still greater increase, and show that there is little basis for the contention that the recent increase in mine values will put a stop to general development. Certain mines may curtail development temporarily, but business conditions soon require them to develop for a reasonable margin of safety in their ore reserve.

"Although there is a net increase, a number of properties have been reduced, indicating that the net result is due to an independent consideration of each property on its merits. It is significant also that the changes are nowhere large, one way or the other, except for new discoveries, whereas, last year changes as high as 100% were discussed at the hearing. This year the changes discussed were, for the most part, below 10 or 15%. One fact alone makes it certain that no net deductions in the total mine valuations will be made for some years to come and that is the large amount of ore existing in the county, which has thus far been estimated only on drilling, and given a low valuation to allow for the usual contingencies for opening the property. As these properties are developed and the ore is shown up by underground workings, the value per ton is automatically increased under the system used by the tax commission, and the increase will continue for each property until the property has established a standard value for its ore.

"The tax commission is arranging to have the work of appraisal established on a systematic basis to run continuously through the year, so that records and information can be kept and the details more closely followed. The much smaller difference of opinion as to mine values which appeared at this year's hearing, as compared with last year's, warrants the belief that a continuation of the present method of mine appraisal will soon yield results on which there can be no essential difference of opinion."

At Crystal Falls, a representative of the Crystal Falls Taxpayer's Association appeared before the commission to contend that general property was assessed too high, as compared with the mines. Figures were presented to show that before the Finlay appraisal, the mines at Crystal Falls were assessed for $750,000, and general property for $500,000. After the appraisal, the mines were assessed at $1,500,000 and general property remained the same. But last spring the city Board of Review decreased the mine assessments by $286,000, and raised the general property to $900,000. Also, it was maintained, two business blocks in Crystal Falls pay, respectively, 35c. and 47c. in taxes for every dollar in profit taken in, while the Bristol mine pays only 3c. in taxes on each dollar of profit.

The Brazilian Chamber of Deputies, says the *Daily Consular and Trade Reports*, has approved a motion recommending that a commission should be appointed to take up the matter of a new mining law.

[2]Eng. and Mining Journal, Feb. 24, 1912.

New Publications

ELEMENTS OF DRAWING. By George F. Blessing and Lewis A. Darling. 6x9, pp. 193, illus. John Wiley & Sons, New York.

SOUTHERN VANCOUVER ISLAND. By Charles H. Clapp. 220 pp., illus. Memoir No. 13, Canada Department of Mines, Geological Survey Branch, Ottawa.

REPORT ON THE BUILDING AND ORNAMENTAL STONES OF CANADA, VOL. I. By William A. Parks. Pp. 382, illus. Canada Dept. of Mines, Mines Branch, Ottawa.

PORTLAND-CEMENT RESOURCES OF ILLINOIS. By A. V. Bleininger, E. F. Lines and F. E. Layman. Pp. 121, illus. Bulletin No. 17, Illinois State Geological Survey, Urbana.

THE JOURNAL OF THE IRON AND STEEL INSTITUTE, VOL. LXXXV, No. I, 1912. Edited by George C. Lloyd. 5½x8½, pp. 688, illus. E. and F. N. Spon, Ltd., London, Eng.

REPORT ON THE UTILIZATION OF PEAT FUEL FOR THE PRODUCTION OF POWER. By B. F. Haanel. Pp. 145, illus. Canada Department of Mines, Mines Branch, Ottawa.

THE TASMANITE SHALE FIELDS OF THE MERSEY DISTRICT. By W. H. Twelvetrees. Pp. 125, illus. Geological Survey Bulletin No. 11, Tasmania Department of Mines, Launceston.

GAZETTEER OF SURFACE WATERS OF CALIFORNIA. PART II, SAN JOAQUIN RIVER BASIN. By B. D. Wood. Water-Supply Paper 296, U. S. Geological Survey, Washington.

MINERAL RESOURCES OF ALASKA. Report on Progress of Investigations in 1911. By Alfred H. Brooks and Others. Pp. 360, illus. Bull. 520, U. S. Geological Survey, Washington.

THE KEWEENAW SERIES OF MICHIGAN. By Alfred C. Lane. In two volumes. Pp. 983, illus. Publication 6, Geological Series 4, Michigan Geological and Biological Surveying, Lansing.

THE FREEZING-POINT, BOILING-POINT AND CONDUCTIVITY METHODS. Second Edition, revised. By Harry C. Jones. 5¼x8¾, pp. 75, illus. Chemical Publishing Co., Easton, Penn.

JOURNAL OF THE CANADIAN MINING INSTITUTE, VOL. XIV. Proceedings of the Thirteenth Annual Meeting, Quebec, 1911. 5¾x8¾, pp. 730. H. Mortimer Lamb, Secretary, Windsor Hotel, Montreal.

THE PRINCIPLES OF PARALLEL PROJECTING-LINE DRAWING. By Alphonse A. Adler. Part I of The Theory of Engineering Drawing. 6x9, pp. 66, illus.; $1. D. Van Nostrand Co., New York, N. Y.

THE DESIGN OF STEEL MILL BUILDINGS AND THE CALCULATION OF STRESSES IN FRAMED STRUCTURES. By Milo S. Ketcham. Third edition, revised. 6x9, pp. 78, illus.; $4. McGraw-Hill Book Co., New York.

SUMMARY REPORT OF THE GEOLOGICAL SURVEY BRANCH OF THE CANADA DEPARTMENT OF MINES FOR THE CALENDAR YEAR 1911. Pp. 422, illus. R. W. Brock, Director, Geological Survey, Ottawa, Canada.

WATER RESOURCES OF CALIFORNIA. Part I, Stream Measurements in Sacramento River Basin. By H. D. McGlashan and F. F. Henshaw. Pp. 411, illus. Water-Supply Paper 198, U. S. Geological Survey, Washington.

SURFACE WATER SUPPLY OF THE UNITED STATES, 1910. Part IX, Colorado River Basin. By W. B. Freeman, E. C. La Rue and H. D. Padgett. Pp. 233, illus. Water-Supply Paper 289, U. S. Geological Survey, Washington.

SUMMARY REPORT OF THE MINES BRANCH OF THE DEPARTMENT OF MINES OF CANADA FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1911. Pp. 208, illus. Canadian Dept. of Mines, Mines Branch, Ottawa.

SURFACE WATER SUPPLY OF THE UNITED STATES. 1910. Part XI, Pacific Coast in California. By W. B. Clapp, F. F. Henshaw and H. D. McGlashan. Pp. 218, illus. Water-Supply Paper 291, U. S. Geological Survey, Washington, D. C.

MINERAL RESOURCES OF MICHIGAN, WITH STATISTICAL TABLES OF PRODUCTION AND VALUE OF MINERAL PRODUCTS FOR 1910 AND PRIOR YEARS. Prepared under the direction of R. C. Allen. Pp. 465, illus. Publication 8, Geological Series 6, Michigan Geological and Biological Survey, Lansing.

TUNNELING: A PRACTICAL TREATISE. Sixth edition, revised. By Charles Prelini. 6x9¼, pp. 349, illus.; $3. D. Van Nostrand Co., New York.

This book was evidently written for civil and railway engineers. It will prove disappointing to mining engineers.

TIN DEPOSITS OF THE WORLD, WITH A CHAPTER ON TIN SMELTING. Third Edition, Revised. By Sydney Fawns. 5¾x8½ pp., 301 illus. Mining Journal, London, Eng.

This volume aims to treat completely the geology, prospecting, lode and alluvial mining, and smelting of tin, all in one volume. Owing to the ground covered, and the fact that much of the book consists of excerpts from recent papers by various authors, the book is lacking in continuity, and logical presentation. However, we do not know how more could be gotten in the space allotted, nor do we see how the engineer who is interested in tin mining can well do without this last edition of what may be considered a classic.

DIAMOND DRILLING AT POINT MAMAINSE, ONT. By Alfred C. Lane; introduction by Alfred W. G. Wilson. Pp. 59, paper, illus. Mines Branch, Canadian Department of Mines, Ottawa.

This report is published in connection with an investigation now being carried on by Dr. Alfred W. G. Wilson into the copper resources of Canada, including abandoned mines and prospects, which, under improved mining methods, may be made productive. In view of changing conditions, it is regarded as desirable to preserve the records of past exploration work, as a guide to future explorers. The occurrence of amygdaloids, carrying native copper, on the northeast shores of Lake Superior, has been known for many years. A number of mining companies have explored portions of these deposits, but no property has been successfully developed. The present bulletin contains detailed descriptions, by Dr. Alfred C. Lane, of the results of diamond drilling carried on by the Calumet & Hecla Mining Co. in 1908, at the old Pancake Bay location, near Point Mamainse, at a cost of $25,000. The result was not conclusive as to whether copper occurs in commercial quantities, though it indicated that the region was less promising than others, and that exploration would be relatively difficult and expensive. Doctor Wilson notes that although no large deposits of ore that could be economically worked have been discovered, only a small portion of the district has been explored and that only imperfectly. In the future the exhaustion of other sources of supply may make this district of more importance, in which case these records will be valuable for comparison and guidance.

OIL FINDING. By E. H. Cunningham Craig. Cloth, 5x8 in., pp. 195, illus.; $2.40. Edward Arnold, London. Longmans, Green & Co., New York.

This book is a clear, accurate and readable exposition of the fundamental principles governing the occurrence of petroleum. It is written by a geologist experienced in the oilfields of Trinidad, Persia and Burma, primarily for the edification of other geologists, but the language is so simple and the processes of reasoning so clear that they can be easily grasped by any reader. The author expresses the hope that the book may be the means of correcting misapprehensions in the minds of actual or potential shareholders in oil companies. While the introductory chapters on the origin of petroleum are mainly controversial, the remainder of the book is characterized by a plain statement of observed facts, as opposed to scientific theories.

As to the origin of petroleum, the author states truly that it is not an academic question, but that a correct conception is essential as a means of distinguishing favorable from unfavorable conditions for its occurrence. He then takes his stand squarely in support of the theory of vegetable origin, and it must be conceded that he makes out a strong case in its favor, at the same time showing the weakness of the opposing theories.

His view is that petroleum was extracted from plant accumulations, deposited among beds of clay or sand mainly in the deltas of old rivers, by the exertion of great pressure, at comparatively low temperatures, and in the presence of a limited quantity of water. Against the animal origin theory he points out that the entombment of the fatty parts of animal tissue, in adequate amounts to yield our supply of petroleum, is contrary to our experience and is beyond comprehension; also that the corresponding deposits of phosphatic material are not observed in conjunction with petroleum beds.

On the subjects of the migration of petroleum, of its subterranean storage, of its lateral variation, and of the relation of its occurrence to geological structure, many of the author's conclusions are equally bold, but the relevancy of the observations he brings to their support must be admitted.

The chapter on indications of petroleum is a clear summary of the conditions which would lead one to suspect the presence of petroleum in any locality, and the chapter on the location of wells makes practical application of theory to the matter in hand, and is the most practically valuable section of the book.

The last two chapters contain hints as to equipment for an oil survey in new territory, general advice as to methods of field work, and suggestions on the preparation of maps and reports.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

J. T. Fee is drilling an iron property north of Fort William, Ontario.

Harold Titcomb has been examining mines in the Transbaikal province of Siberia.

E. D. McDermott has been appointed manager of the Tanalyk copper mine, in Eastern Russia.

A. B. Willmott and J. W. Astley have completed an important examination in eastern Ontario.

Dr. James Douglas returned to New York on Nov. 11, after four weeks' absence in the West.

Joseph F. B. Erdletts has been in Russia and Siberia on professional business for the past six months.

Ross B. Hoffman has been engaged during the summer in professional work near Nikolaievsk, Siberia.

Frederick Laist, superintendent of blast furnaces at Anaconda, Mont., is in the East on a tour of inspection.

Edward H. Benjamin, president of the Joshua Hendy Iron Works, San Francisco, visited New York this week.

E. K. Soper is absent on leave from the Geology Department of the University of Minnesota and has gone to Sierra Mojada, Mexico.

Kirby Thomas has returned to New York from a professional trip to eastern Ontario and to Port Henry, N. Y., and the iron district on Lake Champlain.

August O. Hoffmann has resigned as manager of the Polevskoi Mining & Smelting Co., in Russia, and has been in London on professional business.

W. S. Keith has severed his connection with the F. B. Keener mining companies and will establish an office at Dutch Flat, Calif., as a consulting mining engineer.

Edwin Higgins has been appointed assistant engineer in the U. S. Bureau of Mines, and is at present stationed at Pittsburgh, but expects to go to Michigan soon.

Sanford E. Thompson announces the establishment of Boston offices, at 141 Milk St. The main offices and laboratory will still be maintained at Newton Highlands.

J. P. Hutchins has returned to St. Petersburg, after examination work on mines for the Cabinet of the Czar of Russia, in consultation with the engineers of the cabinet.

A. C. Paulsmeier, vice-president and chief engineer of the Byron Jackson Iron Works, of San Francisco, has been visiting Seattle, Wash., and Vancouver, B. C., on business.

C. A. H. de Saulles, general manager of the Prime Western Spelter Co., Iola, Kan., for many years, has taken the position of manager of the U. S. Zinc Co., at Pueblo, Colorado.

Charles A. Banks, formerly of Auckland, New Zealand, is now manager of the Jewel gold-quartz mine and stamp mill, at Long Lake, Boundary district, B. C., in succession to R. Roberts.

Dr. Frank D. Adams was recently the guest of honor at a dinner given at Albany, N. Y., by Dr. John M. Clarke, the state geologist, to celebrate the dedication of the new State Survey and Museum Building. Doctor Adams also represented McGill University at the dedicatory exercises.

Dr. George W. Maynard, one of the first members of the American Institute of Mining Engineers, is recovering from a severe illness at the Engineers' Club, New York. After professional work in Arizona and Colorado, he was taken ill while in Denver, and was brought from that place under the care of a physician.

Sir Stuart Montagu Samuel, of the silver brokerage firm of S. Montagu & Co., London, has had his right to a seat in the British Parliament called in question before a special committee of the House of Commons. The charge is that his seat should be vacated because his firm has recently undertaken the purchase of silver for the Indian government in London.

George D. James, consulting engineer for the Colorado River Exploitation Co., of Salt Lake City, Utah, has been engaged in professional examinations of the mineral deposits in Utah and Arizona, with a view to ascertain the nature of the rare minerals which exist in those regions; especially those of uranium and vanadium; in addition, the copper and gold deposits which have been found in the various localities. He has found that the belt extends from the northeast portions of Utah to the southwest of Arizona, and that with development, much will result commercially.

OBITUARY

Peter Patterson died at Pittsburgh, Oct. 13, aged 70 years. He has been with the National Tube Co. for 42 years, the last 10 years as consulting engineer.

Edward Eggleston Seelye shot and killed himself, Nov. 9. He was 36 years old, was a graduate of Cornell University and the Columbia School of Mines, and was employed at the works of the Orford Copper Co., at Bayonne, N. J. He had been in poor health for some time.

Timothy W. McNamara died recently at Pierre, N. M. He was formerly superintendent of the Auburn mine, on the Mesabi Range, later taking a position with the Colorado Fuel & Iron Co., at Pueblo. He was later transferred to New Mexico, where he had been for the past few years.

Col. Isaac Trumbo died at San Francisco, Nov. 7. At one time he was a large owner of mining property in Utah. He was employed by the Mormon Church as chief counsel for several years. Inside information on the mines of Utah made him rich. For years he entertained lavishly at his home in San Francisco, but since the fire all his weath had slipped away. Recently his pictures and furniture were sold to pay debts.

Societies and Technical Schools

Society of Chemical Industry—At the regular monthly meeting of the New York Section, on Nov. 22, the principal feature will be a lecture on "The Smoke Problem," by Dr. Raymond C. Benner, of the Bureau of Industrial Research of the University of Pittsburgh.

Colorado Scientific Society—At its meeting, on Nov. 2, this society, in response to an invitation from the chairman of the committee of consulting engineers of the U. S. Bureau of Mines on the prevention of accidents in metal mines, appointed a committee for suggestions and otherwise to give advice, particularly from the standpoint of operators and engineers in the Rocky Mountain region. The committee appointed comprises: Victor C. Hills (chairman), C. W. Comstock, Charles A. Chase, George E. Collins and A. J. Hoskin (secretary).

American Society of Mechanical Engineers—The plans for the meeting of the American Society of Mechanical Engineers with the Verein Deutscher Ingenieure, which promises to be the most remarkable tour of the industries in Germany ever offered to American engineers, are being arranged. Mr. Conrad Matschoss, dozent of the Royal Polytechnic High School, of Berlin, has been visiting the United States as a representative of the German society and has been conferring with the Committee of Arrangements regarding itinerary, professional papers, etc. In general, the date of the departure will be June 11, and the party will arrive in Germany on Saturday, June 21. The plans provide for visits to nearly all the important industrial centers of Germany. The final meeting will be held at Munich, July 7, in connection with the Museum of Technical Arts of that city. The entire trip through Germany and the various official receptions are being arranged by a committee of the most important men of the arts and sciences in the German society, and there is a keen interest shown by municipal authorities and the heads of industrial establishments.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Nov. 6—The gradual advancement in methods of ore treatment and the increased employment of machine drills and electric power, have effected a change in the character of men employed in the mines of California. The old-time hand-drill miner is seldom seen except in the beginning of operations of development of new mines or the reopening of old mines. In most of the mining camps in the northern part of the state, the laborers, car men and shovel men are foreigners who have little knowledge of the English language and a majority of them are wholly ignorant of mining work. In nearly all cases of serious or fatal accidents, the cause has been carelessness or ignorance. The scarcity of labor which is now being experienced at California mines is not confined to the common labor, but to skilled labor as well. The maximum wage paid to drill men in the state is about $3 per day. Common labor is paid about $2 a day. It is believed that an increase in wage would give California more and a better class of machine-drill men, but it is doubtful if an increase in the wage of common labor would effect other decided improvement in the class of men engaged in this work. California has a large mixture of foreign races, not only in the mining districts, but in the agricultural fields. There has been a great deal of complaint of the Japanese in the agricultural districts, but this race has not affected the mining districts, and the Japanese who come to this state are not miners and few of them are found in any mining camp. It is unfortunate, at present, that there is a scarcity of labor in the mining districts for many prospects are being developed and old mines reopened.

Denver

Nov. 19—The federal Bureau of Mines has opened an office in the Foster Building. Doctor Holmes has just returned from Silverton, where he went in connection with proposed sites for temporary metallurgical testing plants, for which purpose $50,000 was provided by Congress. Prof. J. C. Roberts, of the rescue and safety department of the Bureau, has returned from Aspen, where he has been fighting the fire in the Smuggler mine, and will continue his efforts during the winter until it is subdued. There are two fires, one at the eighth level and another at the eleventh. A peculiar feature of the fire in the upper workings is that it is believed that one of the walls of the vein, which is in the uptilted sedimentaries, is shale with sufficient carbon in it to burn, and that is feeding the fire as well as the timbers. The lower fire could be drowned out, but that would necessitate the suspension of ore extraction, to which the managemet objects. The Smuggler company has practically leased the whole of Aspen, with a general pumping agreement.

The prediction of W. A. Garrett, chairman of the association of railways, made in a circular letter issued last August to the 26 railways composing the association, in which he warned them of the coming car shortage, is being fulfilled, and is curtailing the output of ore as well as its marketing, and that of other products of the state. It is stated that in August there were 400,000 empties in different railroad yards, while now there is a shortage of more than half that number.

The output of Leadville is being curtailed by the shortage of cars, which is growing worse instead of better, owing to the enormous crop of fruit and agricultural products which has taken all the cars available. The result is that about two-thirds of the lessees in the district, and many of the big mines, have been compelled to lay off a large number of miners until shipping facilities are provided. About 70,000 was the tonnage for October, to which the Western Mining Co., Yak Mining Co., Iron Silver Mining Co., State Consolidated, Ibex, New Monarch, Castle View, Ethelma, Sugar Loaf Consolidated, and Dinero companies largely contributed. In the outlying districts work will be continued through the winter by the Winthrop, Anderson, Kankakee, Ella Beeler, Gleason Gulch and Rockefeller tunnels. Prospecting for carbonate of zinc ores continues throughout the district and the resulting discoveries of that and incidentally of lead-iron ores, continue to increase the monthly tonnage.

The El Paso company's engineer, T. A. Countryman, has now, it is stated, completed his sampling of the mine, which took three months. The report is to be completed in three weeks, when it will be mailed to stockholders. Its purpose is to give the true value of the stock, and upon it depends the construction of a mill. However, some engineers doubt the reliability of the results of sampling the irregular Cripple Creek veins in the usual manner. The flow of water from the portal of the drainage tunnel continues at about 9500 gal. per min. and the recession in all the deep shafts except the Vindicator and Golden Cycle in about four inches per day.

Butte

Nov. 6—The extension of the Butte, Anaconda & Pacific R.R. from Anaconda to the Southern Cross mine, at Georgetown, was completed Oct. 31, on schedule time, and general manager H. A. Gallwey drove the golden spike completing the laying of the rails. Surfacing and ballasting the track is now all that is left to be done, after which a regular train service will be inaugurated. Two cars of ore were shipped, Nov. 1, over the new road from the Southern Cross mine, and two days later the members of the business men's association of Anaconda were guests of the management on a trip over the line. During the construction of the branch a number of properties have been in the course of development, and part of these are now in a position to begin shipping ore at once. Now that transportation facilities have been completed, the Anaconda company will begin the shipment of electrical machinery and equipment for the Southern Cross mine, preparatory to working the property on a large scale as soon as shaft sinking shall have been finished.

The laboratory of the Washoe smeltery at Anaconda was the scene of a destructive fire on the afternoon of Nov. 4, which resulted in nearly the complete destruction of the building. It is believed that the fire was caused by short-circuiting of electric wires. The laboratory and testing department, as well as several offices, were completely gutted.

In addition to the great activity being displayed in developing the northern portion of the Butte district, the flat directly east of the famous hill is receiving considerable attention. Besides the work being done at the Bullwhacker mine, adjoining East Butte Mining Co. territory, a shaft is being sunk by the Anaconda company on the Tropic claim, northwest of the Bullwhacker, and preparations are being made by the Anaconda company to sink a shaft on the Atlantic claim, northeast of the Tropic. Capt. A. B. Wolvin, who recently bonded the Brundy group of claims in the same district, is now actively developing the Montgomery claim from a shaft 200 ft. deep. Duluth men have acquired control of the

Butte & London property, north of the East Butte, and are preparing to sink the shaft from its present depth of 1200 ft. to the 1600-ft. level. It is planned to crosscut north and south on the 1600-ft. level to the end lines of the property. The original company ran crosscuts on the 1100-ft. level, and opened several veins, without, however, disclosing ore of commercial value. As the bedrock in this portion of the Butte district is covered with 500 ft. of alluvial soil, it is believed that the veins were not intersected at a sufficient depth to correctly gage their contents.

Salt Lake City

Nov. 7—The situation at Bingham continues to improve. Working forces at various properties are being increased. The Utah Copper mine has nearly 2000 men employed, and the mine and mills are being worked at from half to three-quarters capacity. According to officials, a normally efficient working force, capable of a daily production of 20,000 tons of ore, will have been organized in another month. Certain classes of employees at the Magna and Arthur mills are to receive an increase in pay in November. This is understood to be a flat increase, men in different positions receiving a different rate. The scale for locomotive engineers, locomotive firemen and trainmen, working in connection with steam-shovel operations at the mines, will also be increased. The increase, it is said, is not for the purpose of bringing strikers back to work or to avoid a strike, but is made voluntarily for the benefit and recognition of services of those employees who have been loyal to the company's interests, and who have been in its employ before and during the recent disturbances, now practically at an end. The revised scale of wages at the mine and mill is to remain effective while the monthly average price of copper remains at or above 17c. per pound.

During 1911, the Bingham district produced 590,500,000 lb. of blister copper, as shown by the report on copper for 1911, by B. S. Butler, just issued by the U. S. Geological Survey. This production was exceeded by Butte, the Lake Superior district in Michigan, and by the Bisbee, Morenci-Metcalf and Jerome districts in Arizona.

Utah County, though essentially agricultural, takes fourth place in metal mining among the counties of Utah. There are three mining districts; these are American Fork Cañon, which has for some time produced a small, but fairly steady supply of ore; Santaquin, in the southern part of the county, is a comparatively new district, and is attracting attention in its development. About 25% of the output of the Tintic district, which lies on the western line, comes from Utah County, the output from that portion for 1910 being $1964 in gold, 1,478,972 oz. silver, and 18,647,443 lb. lead. The county's total income from metal mining in that year was $1,900,000. There are deposits of coal, marble and asphalt in the eastern part of the county, and marble, onyx, iron, gold and silver west of Utah Lake.

The lead furnaces at the Tooele plant are being operated at full capacity, and much ore is being received. The copper furnaces are still closed down, as the result of the Bingham strike, when operations were discontinued at the Utah Consolidated and other properties. These mines have resumed operations, and shipments of copper ore are being received. The copper furnaces will be blown in as soon as a sufficient supply of ore has accumulated. Shipments of concentrates have recently been received from the Jumbo Extension mill, at Goldfield, Nev.

The Utah Metal Co. is driving its tunnel, and making progress of 10 ft. per day. Two shifts are being worked in driving the Tooele heading, work on the Bingham end having been discontinued for the present. During the week ended Oct. 20, progress of 65 ft. was made. The Tooele end is in about 8000 ft., and there remains about 1050 ft. still to be driven for the completion of the 11,000-ft. tunnel.

Negaunee

Nov. 8—The Cleveland-Cliffs Iron Co. recently held a competitive first-aid contest at Ishpeming. Seven teams participated. The demonstrations included treatment of broken rib, fracture of leg, injury to the temple, and care of a person overcome by gas. Many officials, mining captains, shift bosses and engineers of the Cleveland-Cliffs Co. and of the Oliver Iron Mining Co. witnessed the contests. The judges decided that the first prize, bronze medals, be awarded to the five men comprising the team of the Stephenson Mine at Gwinn. The Austin Mine team won second prize, and the Negaunee Mine third prize. The other mines represented by teams were: Cleveland Lake, Cliffs Shafts, Salisbury and North Lake. Dr. Shields, of the American Red Cross Society, one of the judges, gave a talk on mine rescue work. The present teams at the Cleveland-Cliffs Iron Co. mines have been organized for more than a year. They will now start to train second teams, and it is planned to break in a new team each year, so that in time the knowledge of first-aid treatment will become general among the employees.

Considerable interest has been exhibited at various times in the matter of mechanically drying Lake Superior iron ores at the mines. The ores of the Mesabi range commonly contain from 10 to 16% moisture, Swanzy range ores average about 14%, and the ores of the Negaunee basin and the Gogebic range run almost as high. For example, the Brunt mine of M. A. Hanna & Co., at Virginia, Minn., ships "Brunt ore" which, when dried at 212° F., averages about 56% iron, but in its natural state contains 15% moisture. Practically all of the moisture remains in the ore until it is dumped into the blast furnace. High moisture, besides making greater freight charges, makes trouble by freezing in cold weather, and frequently causes explosions in the blast furnaces. Several years ago, M. A. Hanna & Co. installed a mechanical ore dryer at the Hollister Mine at Crystal Falls, but shortly afterward for various reasons the mine was closed down and abandoned. It is now announced that M. A. Hanna & Co. has contracted with the Ruggles-Cole Engineering Co. for the installation of a mechanical ore-drying plant at the Brunt Mine at Virginia. The plant will consist of two cylindrical dryers, 90 in. in diameter and 55 ft. long, with a capacity per dryer of 23 tons of iron ore per hour to reduce to about 6% moisture.

Toronto

Nov. 8—Difficulties have arisen in connection with the recording of claims in the Nighthawk Lake area. At the time of the first rush to that place in August, 1907, claims were recorded in Haileybury. When Porcupine was discovered and a new mining division created, the Nighthawk Lake area was included in it, but in the meantime many of the claims at first staked had either been patented or allowed to lapse. Many of the records, especially those referring to patented claims, were transferred to Toronto. Owing to loss or mistake in transfer the maps furnished to the Porcupine office were incomplete in showing where claims had been patented. In the last rush several old claims which were supposed to have lapsed through the nonperformance of assessment work, were staked and recorded. It has since been ascertained that some of these old claims, including several adjoining the Hyde-Markey group, had been duly patented and the patents are still valid.

The necessity of the proposed amendments to the law regulating the use and storage of explosives was shown by an explosion which occurred Oct. 23, at the Energite Explosive Co's. plant at Haileybury, Ont., in which five men were killed and three injured. The explosion was supposed to be caused by a fire which originated in the grinding room. At the inquest the Coroner's jury found that the factory owners were to blame on the ground that the building was not fireproof. They were unable to arrive at a conclusion as to the direct cause of the explosion, since the product manufactured, known as cheddite, had been regarded as not explodable by fire.

The Mining News

The Current History of Mining

Alaska

The season's output for the Nome district is estimated at $3,500,000. Nearly all the dredges are still operating, and if the weather continues mild, work may be carried on until December.

Captain Spalding and associates have purchased a two-stamp Hendy mill for their Dome Creek property. The mine is said to be yielding more than $1000 per day.

Alaska Gold Mines—Five hundred men are now at work developing the mine and doing the surface construction work preliminary to the erection of the 6000-ton mill. At the Perseverance, although no actual mining is being done, the stopes are in shape to draw the ore without injury, and the mill of the former company is running full capacity. This mill will be used to test the various methods of treating the ore. In the mine the Alexander crosscut is being widened. At the main station, at the intersection of this crosscut and the Perseverance vein, the incline raise and vertical shaft is progressing satisfactorily. This is the main piece of development work and is being pushed as rapidly as possible. In connection with the power-plant supply, the surface horse tram is completed to the face of the dam site, the flume grade is completed, and the flume is in course of construction. Three sawmills are working steadily to put out the lumber necessary for the various divisions; the site for the power house is excavated and all of the wiring of the transmission lines, with the exception of a small section, is completed. The electrical machinery is beginning to arrive. At the Sheep Creek tunnel, which will be driven to intersect the vein at greater depth, the concrete foundations for all the machinery have been laid and finished, and the compressor is being installed. A crew of experienced men has been secured for driving this tunnel.

Arizona

Mohave County

Mocking Bird—The mill and cyanide plant were recently put in operation under the direction of A. F. Muter. The ore averages about $20 per ton. W. H. Hall is superintendent.

Dixie Queen—This property is reported to be under bond to California men, who contemplate immediate development work.

Mossback—The First National Bank, of San Diego, has applied for patent on the Mossback and adjacent claims, in the Silver Creek district. These claims were formerly owned by C. H. Burlock.

Bi-Metal—An examination has just been made of this property by Walter Bunce and Walter Beam, of Denver. The property is situated in Kingman Cañon, about three miles south of Kingman, along the Sante Fé right-of-way.

San Francisco—The recent strike has given rise to the development of ore, which continues to increase in width and value as driving progresses. At the site of present operations, the vein is more than two feet wide. The strike was made at a depth of about 600 ft. on the vein.

Vivian Mining Co.—This company, under the management of S. R. Porter, is making improvements in equipment. Three 40-hp. gasoline engines, electric generators and motors are to be installed. The shaft is to be sunk to the 500-ft. level.

Gold Reed Mining & Milling Co.—A gasoline hoist has been installed on the Jupiter group of claims. The shaft is below the 100-ft. level, and it is the intention to sink to 500 ft. or more. H. H. Shuck is in charge of the development work.

Metallic Accident—Ross D. McCauseland has taken an option on this mine, in Mineral Park, from Thomas McNeely, and has put a small force of men at work, with Walter Burkhart in charge. In the early days of the district, rich ore was taken from this property, with a comparatively small amount of development work.

California

Humboldt County

N. C. Halliday and R. Meitz, of Eureka, are contemplating the installation of a stamp mill, at Bonnieville, near claims recently discovered at Willow Creek, where high-grade free-milling ore has been uncovered near the surface. Some of the ore has been tested by cyanidation with reported satisfactory results.

Inyo County

Four Metals Mining Co.—Stockholders and unsecured creditors have made legal protest against the sale of this property to Louis D. Gordon, mining engineer, on a bid of $500. Gordon agrees to pay debts, amounting to $250 000, secured by a trust company of San José, the principal place of business of the company. The mine in dispute is the Cerro Gordo. It is said that part of the zinc and silver in the tailings and the ore dump can be profitably recovered.

Kern County

Alameda—Litigation which has been keeping this mine idle has been settled; the title is clear and the mine is being reopened. S. J. Montgomery, of Randsburg, is owner.

Mays Consolidated—No. 4 well came in, Oct. 20, and for an hour flowed at the rate of about 25,000 bbl. per 24 hr. It then sanded up. It was beyond control while flowing, the oil being forced by heavy gas pressure over the derrick. The well was drilled to 2000 ft. with a rotary rig by the California Well Drilling Co. It was finished with cable tools at 2950 feet.

Kern Trading & Oil Co.—No. 39 well came in on Oct. 17, and a week later was flowing at the rate of 45,000 bbl. per 24 hr. The oil started at 24.6 gravity and settled to 23 gravity. The drillers were unprepared for the heavy flow, and the Standard and the Associated arranged to carry most of the production, until sumps and reservoirs can be built. A temporary dam broke and 3000 bbl. of oil was lost. The well is said to be making no noise, which is rather unusual in the flow of large gushers. In one day the Standard and Associated saved 45,000 barrels.

Mariposa County

Treasure—Six of the eight liens filed against this property last August have been satisfied. The prospects are fair for reopening the mine, which is in the Quartzburg district.

Nevada County

Prudential—Six miners have taken a lease on this mine, which was formerly a producer but failed to meet the demands of promoters. San Francisco men took the mine over, but litigation prevented profitable operation. A. P. Wilson, of Grass Valley, who has been employed for several years in care of the pump and machinery, and the five other men associated with him in the lease, will undertake to reopen and start the mine again.

New Manzanita Mining Co.—The old Manzanita mines, near Nevada City, are to be reopened, and hydraulic mining again introduced in the district. These mines were profitable in the days of hydraulic mining. The new company is making preparations for building a re-

taining dam that is believed will satisfy the law regarding hydraulic mining.

SHASTA COUNTY

Bully Hill—The experiments in the extraction of zinc ore are still progressing at Winthrop.

Gambrinus—The mine and mill are being equipped for winter work; crushing will be resumed.

TRINITY COUNTY

Bonanza King—Two miners were killed by a cave-in, Oct. 25.

TUOLUMNE COUNTY

Mangante—Work has been resumed at this mine, on the western edge of Jamestown. The mine will be unwatered preparatory to extended development.

Colorado

CLEAR CREEK COUNTY

The mines on Democrat Mountain near Georgetown are credited with a production of about $10,000,000. The Kelly tunnel has been driven 2800 ft. into the mountain and is close to an intersection of the big veins that in the early days produced so largely from the surface. It is now stated that within 30 days an Eastern syndicate will take over the property and resume the driving of the tunnel. The compressor plant and machinery have already been overhauled and made ready for starting. On the La Plata, Parker & Connors, leasing 1200 ft. from the portal of the crosscut tunnel, have opened a vein of smelting ores.

Clyde—Ore proved for 100 ft. in length has been opened in this mine on Lincoln Mountain and 700 lb. of ore sent to the smeltery as a test gave returns of nearly $200 per ton in gold.

Kittie Ousley—This mine in the Argentine district has been cleaned out, retimbered, and is shipping four tons per day of high-grade ore to the local sampler.

Ready Cash—Five tons of ore shipped by John de Votie from this mine, close to the line of Clear Creek and Grand Counties, ran 340 oz. silver per ton. Work had to be stopped for the winter on account of the great altitude, but will be resumed next spring.

Presidential—A contract has been let to W. H. Morris to drive this tunnel another 100 ft. into Republican Mountain, making a total length of 1100 feet.

Empire—This tunnel, on Covode Mountain, which is already in 2200 ft., is being cleaned out and retimbered and the compressor plant and pipe line is being repaired. Machine drills will be started at once.

Seven Thirty—McGuire & Co., lessees, are operating through the Hercules level and recently shipped five tons of ore. Parrachini & Co., leasing in the upper workings, are shipping 15 tons monthly.

GUNNISON COUNTY

Raymond Co.—The Chicago tunnel in Jones Gulch is being cleaned out and will be driven to meet the 1600-ft. tunnel of this company, which has its portal on Ohio Creek and is 3300 ft. in length. It adjoins the Gold Links tunnel, which is 4000 ft. in length and the Carter tunnel, 6600 ft. long, all of which have intersected the system of gold-bearing fissure veins in what is known as the Gold Brick mining district. The Raymond Co. is managed by Eugene Lamont, of Denver, and has just opened a fine vein of high-grade gold ore.

LAKE COUNTY—LEADVILLE

New Discovery—A carload of silver-lead ore has just been shipped from the south end of this claim by lessees Double-check & Co. Below this ore is good iron ore from which shipments may be made in a few days.

May Queen—Lessees of this Fryer Hill mine have opened new zinc-carbonate ore in the lower level, and are shipping steadily.

Ella Beeler—About two carloads of lead ore carrying some silver are being shipped by the lessees from the lower tunnel of this mine in Iowa Gulch. The upper tunnel is being driven to the Houston vein.

Fanny Rawlings—This mine, which in 1904 was noted as a gold producer, is now being prospected for zinc-carbonate ore, and recently a vein was opened

Idaho Tungsten Co.—It is reported that the new mill on Patterson Creek is producing daily five tons of 60% tungsten concentrates, which will be stored until spring and then be hauled by wagon to Leadore, the nearest shipping point.

TELLER COUNTY—CRIPPLE CREEK

Gold Sovereign—It is reported by Superintendent Jackson that ore has been opened for 50 ft. along the vein. There are 300 ft. of backs above this strike.

Blue Bird—The shaft is 1770 ft. deep, the deepest in the camp by about 100 ft., but at this depth water was reached and work has been suspended until the water recedes, which it is doing at the rate of four inches per day. There is no change in the formation.

Dead Pine—The output of this mine, which is under lease to Carnduff & Duncan, is a car per day. The ore is mined from the fourth and sixth levels. On the fourth level the shoot is about 150 ft. long and four feet wide and the stope is 75 ft. high. On the sixth level the ore has been opened for about 100 ft. and the stope is 50 ft. high. There is a large tonnage of ore in sight. Royalties amount to $8000 per month.

El Paso—It is reported that 75 men are working on the 12 leases above the 400-ft. level, and that in October they produced ore worth $30,000. A dividend of 10c. per share on the new $5 shares has been declared and the erection of a 500-ton mill is under advisement.

Portland—The fact that at the 1600-ft. level and at about the same level in the Vindicator on the other side of the camp, large bodies of sulphide ore are being opened, equal in value to those of the levels above, is a most encouraging feature about the zone of ore now being mined below the old water level. There is, according to F. G. Peck, the president of the company, a vast body of sulphide ore in the new strike on the Portland 1600 level.

Stratton's Independence—During September, 3049 tons of 11-dwt. ore was produced and 10,600 of low-grade mine and dump ore were milled. The net working profit was $10,410.

Idaho

COEUR D'ALENE DISTRICT

Bunker Hill & Sullivan Mining Co.—Arrangements have been made with the Engineering Construction Co., of Spokane, to replace the timbers recently destroyed by fire, and some of the other timbering in the mine with concrete supports. It is estimated that the initial undertaking will cost $7000, and will be made on a percentage basis.

Marsh—E. J. Carter and Volney D. Williamson have purchased control of this mine, near Burke. Earl W. Greenough will be retained as general manager. Extensive improvements are planned and the sinking of a three-compartment shaft, which will permit operation at full capacity, has been started. The shaft, which starts at a place considerably east of the old two-compartment incline shaft, will be sunk 400 ft. An Ingersoll-Rand 12-drill compressor, driven by a 150-hp. motor, a new air hoist and other necessary machinery, have been installed.

Bear Top Consolidated Mining Co.—Mineral claims, concentrating plant and all appurtenances of the Twin Star Mining Co. and the Bear Top Consolidated Mining Co. were advertised to be sold at auction, at Wallace, Nov. 15. Included in the assets of the Bear Top is a concentrator of 150 tons daily capacity and a water right.

Idora Hill—A 75-ton concentrator will be built on Beaver Creek.

IDAHO COUNTY

Bengal—After driving 60 ft. on the vein from the crosscut and showing up an orebody 5 ft. wide, the owners have decided to build a road to Elk City and ship ore to the Elk City reduction works. The drift shows 3 ft. of oxidized ore.

Revenue—A large shoot of silver ore which can be sorted to $200 per ton, is reported from the tunnel on the American River side. Preparations are being made to ship a car to the Tacoma smeltery.

Michigan

COPPER

Mayflower—The results of drilling have been encouraging. No. 22 hole, which recently cut the lode, revealed a core from a depth of 1011 ft. to 1133 ft. that carried copper for practically the entire distance. The assays of the sludges from the drilling for 88 ft. of that distance, or from a depth of 1019 to 1107 ft., showed an average tenor of 30.8 lb. of copper per ton. The copper is in the form of shot and fine copper easily recovered in the mills, and the formation is comparatively soft amygdaloid. Drilling will continue at this hole, which is now sinking below the 1400-ft. level until the basal conglomerate is reached, which is expected at any time. Hole No. 23 will then be started to the north of No. 22, and No. 24 still farther north. These holes will reach the formation at shallower depth. Holes Nos. 15 and 17, the discovery holes, showed about 26 and 32 lb. of copper per ton, respectively, and hole No. 20 ran about 30 lb. It is probable that upon the completion of holes Nos. 23 and 24 active steps will be taken toward the opening of a shaft to develop this lode.

Indiana—The shaft is about 1150 ft. deep and has passed through a vein of copper ore about 25 ft. through and into a native copper formation of good characteristics. Sinking is being continued to cut the felsite formation from which such a remarkable core was extracted a few years ago. The presence of copper was revealed by the core, but it was not thought that it would develop into such proportions as the present indications point to. The shaft is nearing the point where the felsite formation should be reached and further work will be watched with interest.

Oneco—Operations at this property are confined to driving north and south at the 12th level and south at the 11th level with encouraging results.

Superior—For the last two months a slight curtailment has been made in shipments to the Atlantic mill and attention has been paid to putting the property in shape to handle a greater production from the West lode which continues developing ore richer than that in the main lode at No. 1 shaft. As soon as the railroad connections are completed ore will be shipped to the mill of the Lake Milling, Smelting & Refining Co. and normal production will be resumed. A decided improvement should be made in the mineral yield, as the losses in the Atlantic mill are high. During the month of October a little over 11,000 tons of ore was stamped.

Keweenaw—Two diamond-drill outfits are to be started at once on the Delaware tract of this company, which will continue drilling throughout the winter. Negotiations toward taking over the Arnold, Ashbed and Meadown properties have not been completed, but there is little doubt as to the successful outcome of this effort.

Victoria—This company's new, or No. 6 shaft, is down about 900 ft., which corresponds with the 12th level of the main working or No. 2 shaft. A drift has been started from the No. 6 shaft to connect with the main workings, which are about 3450 ft. apart. For a short distance some fine ground was cut but has passed out of the line of drift and a crosscut has been started to pick it up again.

Adventure—Driving on the No. 1½ lode continues and is developing a run of good ground; driving also continues on the No. 3 lode.

IRON

Bengal—Bids are being received for a 105-ft. steel headframe. A No. 7½ McCully gyratory crusher, similar to the one at the Zimmerman mine, will be installed, and a brick transformer house will be built. The brick-and-steel engine house is nearly completed. Electrical power will be supplied by the Peninsula Power Co., of Iron Mountain. Eleven company dwelling houses are to be built.

Verona Mining Co.—The new main offices at Palatka are completed. Four more company dwelling houses are to be built near the offices.

Tully—A contract has been let by Corrigan, McKinney & Co. for the construction of 44 dwelling houses; some will be 1½-story five-room cottages, and others two-story houses with six or eight rooms. Knute Nelson, of Crystal Falls, has the contract.

McGreevy Steel Co.—A site is being cleared for a shaft at the Purcell property north of Iron River; Paul Chamberlain in charge.

Minnesota

COPPER

The Keweenaw Western Development Association, that controls a large acreage of lands in the vicinity of Hinckley, Minn., and situated on the theoretical extension of the Keweenaw copper series, has contracted with Buffalo men for the sale of a large block of the association's stock. Development on the property consists of a shaft about 80 ft. deep, sunk on the incline, from the bottom of which crosscuts extend at right angles to the formation. Other surface exploration consists of extensive trenching, in cutting which a number of copper-stained amygdaloid lodes have been exposed. Plans for further development have not yet been announced.

CUYUNA RANGE

According to reports, hydraulic mining has been instituted on the Cuyuna range, on property owned by the Carlson-Williams interests. The equipment is said to consist of two 100-hp. motors, each connected to duplex pumps delivering 2000 gal. of water per min., under 50 lb. pressure. The dirt is carried away in a large flume. The company expects to handle as much overburden with its two pumps as two steam shovels could do, and at present is cutting away about 1000 cu.yd. in 12 hours.

Some officials of the U. S. Steel Corporation recently visited Cuyuna Range properties.

Cuyuna-Mille Lacs—Returns upon the initial shipment of five cars of ore to the Lake Superior Iron Co. furnaces at Ashland, give a total metal content of 61.9%, including 31.5% manganese.

MESABI RANGE

Adams—Two crews will be kept at work all winter to clear the embankments so as to prevent slides, and to prepare in other ways for next season's operations.

St. Paul—The stockpile, estimated as containing 50,000 tons of ore and which has been stocked for five years, is now being shipped. Underground work is being planned for the winter.

Ruddy—The body of the third victim of the flooding of this property two months ago has been recovered. The other two bodies were recovered about a month ago.

Missouri

JOPLIN DISTRICT

A rich strike has been made on the Lehnhard land, north of Aurora. Ore was struck at 226 ft., which extended to a depth of 274 ft. Two drill holes 200 yd. apart are in the ore and drilling is to be continued.

American Zinc, Lead & Smelting Co.—Several operators are developing small leases on this company's land, east of Joplin. Swager & Co. are sinking a shaft on a four-lot lease.

Osceola Lead & Zinc Co.—This company has leased all tools and equipment on the Kelley land, north of Webb City, together with right to mine, to the Arville Mining Co. Royalty is to be 20%. length of lease one year.

Gray Mouse—This is a new mine in the Neck City field, which has just been put on the producing list. The company has a 45-acre lease, six drill holes in ore and two shafts down. It is a soft-ground mine with a 17-ft. face. The ore is hand jigged at present, but a mill is contemplated.

Mariposa Mining Co.—This company has been drilling on the Amsden land, northwest of Carthage. Three holes are in ore and a fourth has been started. An 8-ft. face of lead ore was found at a depth of 35 ft., with 22 ft. of zinc "clip-

pings" below it. A second ore run was encountered at 150 feet.

Granby Mining & Smelting Co.—This company has completed 20 drill holes on Sec. 36, southeast of Diamond, Newton County. Lead and zinc "shines" were found in 19 of the holes, but nothing rich. This is virgin territory, and while no plans have at present been formulated for mining, it is believed that the company will eventually develop the property.

Onondaga Mining Co.—This company, operating on its own land, at Spring City, is piling up a heavy tonnage of blende concentrates in its bins. The mine being west of the developed ore run causes the production to be watched with interest. The mill and equipment is new and complete.

No Name—A new shaft has been sunk by Haggart & Jones, on their lease of the Jones land, southeast of Villa Heights. Some lead and much calamine is being mined, the ore being hoisted through two shafts from a depth of 60 ft., and cleaned on two hand jigs.

Aberdeen—An unusual method of mining for this district is used at this mine. Instead of carrying the ore face from the shaft, drifts are being driven to the limits of the ore. Then the ore will be mined back toward the shaft. This is to prevent the danger of a cave-in, as the ground is soft.

Montana

Butte District

East Butte—Shaft sinking has been resumed at the Pittsmont property, the intention being to continue without interruption to the 1800-ft. level, and possibly 200 ft. lower. Excellent ore has been opened on the 1200-ft. level, and it is principally due to this fact that the management has decided to open the lower levels as soon as possible. The monthly output of the mine averages about 1,250,000 lb. of copper at present, the ore being mined from the 800- and 1200-ft. levels, and it is the intention to maintain this average as long as copper is at the present price, regardless of the amount of development work in progress. Steel for the enlargement of the two furnaces, now in use at the smeltery, is on hand, but as the alterations will necessitate shutting down the plant for one or two months, it has not seemed advisable to lose any time while the price of copper is high.

Tuolumne—During October the production of this mine consisted of approximately 492,200 lb. of copper, and 13,200 oz. of silver. The ore is being mined on the 1600- and 1800-ft. levels, about one-third having an average value of 10% copper from the former level, and the remainder averaging about 5% copper from the 1800-ft. level. Station cutting has been completed on the 2000-ft. level, and sinking will be continued to the 2200-ft. level, after which development work will be started on both levels simultaneously.

Badger State—Fire has broken out in this and the Corra mine of the Anaconda Copper Mining Co., and interferes with operations in the Badger State. It is reported that the fire will be easily controlled and is confined to old workings.

Cascade County

Mammoth—Guy Stapleton, John Mahoney, and other Butte men, who are operating this group of five claims under a two-year lease, with an option to buy for $70,000, have a force of five men at work. Some good copper ore carrying gold and silver, has been opened during recent development work. The Schulenberg Estate, of St. Louis, Mo., and others are the owners of the Mammoth group.

Deer Lodge County

Butte & Anaconda—A vein of ore assaying well in gold was recently struck at this company's property in the Georgetown district. The ore is free-milling and shipping to Anaconda over the newly completed railroad will probably begin in the near future.

Jefferson County

Boston & Corbin—The foundations for a 200-ton concentrator have been finished, for this property near Corbin. Erection of the building, the material for which is now arriving, will be started at once. It is hoped by the management that the mill will be ready for operation by April, 1913. A vein of silver-lead ore was recently opened on the 1200-ft. level, and driving in both directions on the vein is under way.

Exvein Mining Co.—Butte men recently filed articles of incorporation of this company, organized to operate the Bullock group of claims, 12 miles northwest of Basin on Basin Creek. The company is capitalized with 500,000 shares of $1 stock, and officers and directors are, J. D. Slemons, P. W. Blake, P. J. Brophy, A. J. Bullock and W. C. Lewis. There are six claims in the group, and A. J. Bullock, former owner of the property, has done much development work and shipped high-grade silver-lead ore. The company plans to begin cleaning out some of the old workings within a week or so, and then to start development work.

Lewis & Clark County

St. Louis—A 100-ton mill and cyanide plant is being erected by this company. Concrete walls are now being placed and as soon as the framework is finished the tube-mill and tanks will be put in place. It will be several months before the mill is in operation. In the mine there are large bodies of low-grade ore which can be treated at a profit in this new mill.

Nevada

Comstock Lode

Mexican—October was marked by a heavy production both from mine and mill. The ore mined had a gross assay value of $92,000. The mill treated 1626 tons of ore, the head sample, indicating the total value for the month as $62,620. The apparent extraction was about 95%, and the bullion yield was between $55,000 and $58,000. The company has just acquired control of the Keyes and Monte Cristo mines in Sevenmile cañon, and an aërial tram will be built from the properties to the mill, a distance of more than two miles. An electric hoist is being installed at the Keyes, and exploration work has already been started on the 250-ft. level of the Monte Cristo.

Crown Point—The ore mined in October had a gross assay value of about $18,000 and was milled in the Yellow Jacket mill. Two shipments of concentrate were made.

Consolidated Virginia—The north drift on the 2300-ft. level shows the vein to have widened to eight feet, with five feet of quartz on the hanging wall. The assays continue low.

Ophir—A west crosscut has been started from the main southwest drift on the 2500-ft. level, in an endeavor to find the vein in that direction. The south drift has reached the Consolidated Virginia north line.

Union Consolidated—An air-lift pump is being installed at the 2500 station of the joint Union-Sierra winze, preparatory to resumption of work below the 2500-ft. level.

Sierra Nevada—The south vein on the 2500-ft. level continues to give high assays. In driving north it was found that the vein has been faulted. A crosscut is now being driven to pick it up to the west.

Clark County

Yellow Pine—The production for September consisted of 360 tons of lead concentrate, and 1550 tons of zinc concentrate, the net returns from which will exceed $35,000. The regular dividend of 2c. per share was declared Oct. 25. A crosscut on the fifth level has intersected the vein south of the main fault, showing that the fault had a lateral displacement of 130 ft. This fault cut the main orebody on its dip, and since it is now located, sinking will be resumed at once. On the third level, the vein has been stoped to a width of 60 ft. The new cars and equipment for the railroad have been shipped and it is expected that the company will have two locomotives in operation within 30 days.

Columbia—On this property, a force of men, under the superintendence of B. T.

Hickman, is engaged in cleaning out the old workings, preparatory to sinking the main shaft. New hoisting and surface equipment will be installed. Joseph Dederich, of Los Angeles, is principal owner.

Lincoln—At a depth of 200 ft. in the shaft, a vein of gold and silver ore has been found. The property is six miles west of Jean, and has made occasional shipments of high-grade ore.

South Nevada Gold Mining Co.—This company, which operates the Frenchman mine, six miles south of Las Vegas, has a force of men at work on development, which will be increased to 50, as soon as accommodations are prepared. Some gold ore is already blocked out, and it is reported that a mill will be built in the spring.

Esmeralda County

Goldfield Consolidated—The estimated October production is: 30,442 tons of ore milled for a gross recovery of $401,000; net realization $216,000.

Humboldt County

The Iron Cañon, and Iowa Ore Purchasing & Reduction Co. are operating small mills. Much leasing and prospecting is being done in this county.

The Gold Circle camp is commanding considerable attention; the Esmeralda Mining Co. and the Rex Mining Co. are operating mills. Among the other active properties are the Elko Prince, Colorado Grande, and Eastern Star Mining Company.

Golconda Gold Ledge Mining Co.—This company plans to increase the capacity of the plant. At present there is a scarcity of water.

Lyon County

Mason Valley—During October 27,319 tons of ore was treated, from which 1,646,000 lb. of copper was produced. Shipments during the month amounted to 1,726,000 pounds.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Nov. 2, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,400	147,819
Tonopah Belmont	3,321	108,186
Montana-Tonopah	989	45,452
Tonopah Extension	1,070	44,193
West End	885	33,557
Midway	50	770
MacNamara	380	16,389
North Star	.....	266
Mizpah Extension	.....	40
Jim Butler	300	3,400
Totals	10,395	400,072
Estimated value	$259,875	

White Pine County

Nevada Consolidated—Mill and smeltery are now operating at three-quarters capacity and it is expected that normal capacity operations will be attained within a fortnight.

Oregon

Baker County

Snow Creek—Operations at this mine near Greenhorn are to be resumed at once, and new machinery will be installed.

Golden Eagle—This company has been reorganized, and additional capital put into the property in the Greenhorn district.

Lane County

Vesuvius—Manager F. J. Hard states that development work will be continued on this property all winter, and that he expects to run the 10-stamp mill part of the time.

Utah

Juab County

Crown Point—Driving is being done on the 600-ft. level, which is to be thoroughly prospected before shaft sinking is continued further. Most of the recent prospecting has been done on the 500-ft. level.

Chief Consolidated—The output for the week ended Nov. 1 was 10 cars, taken out in doing development. New orebodies are reported to have been opened recently. The working force, at present concentrated on development work, will be increased and a larger tonnage mined. The mine has lately been sending out as much as 23 cars weekly.

Iron Blossom—A cave mineralized with copper has been opened 50 ft. below the 600-ft. level of the No. 3 workings. The dimensions are 15 to 20 ft. wide by 100 ft. long to the north and south. Ore is being mined from stopes above the 500 in the No. 1 workings.

Gemini—Zinc ore has been found, and leases on ore of this character are being sought.

United Tintic—The workings at this property, which is a consolidation of the Bullock and Aspinwall, are being cleaned of caved material, and a small amount of ore is reported. The shaft is down 280 ft., and driving to the west is being done; the Bullock vein has been reached.

Grand Central—Copper and lead ore of good grade are reported on the 2300, and it is stated that the shaft will be sunk to the 2500 level. The present lowest workings of the mine are the deepest of any in Tintic.

May Day—The October output is given as 18 cars of zinc ore.

Gold Chain—This property has been closed down with about 12 cars of ore in the bins, owing to the engines on the Mammoth high line being laid off for repairs.

Opohongo—This property, which is operated through the Gold Chain, has been closed down. The weekly production has been about 200 tons, the ore coming largely from the 300- and 600-ft. levels. The offices have been moved from Provo to the McIntyre Building in Salt Lake City.

Summit County

Park City shipments for the week ended Nov. 2 amounted to 2,384,380 pounds.

Mines Operating Co.—Two new roasters have been ordered for the mill, which is to treat the old stope fillings at the Ontario, the roasting capacity having been demonstrated to be insufficient.

Barry-Coxe—Under this name this property made several shipments during the last year. Now it is reported to have reverted to James Conelly, the original locator.

Tooele County

Work is being done in the South Stockton district. There has been a fall of about two feet of snow, which it is thought will melt before the coming of winter snows. The camp is connected with Stockton on the Salt Lake Route by a 10-mile wagon road, and road and weather conditions are important. There is talk of a betterment of transportation facilities.

Consolidated Mercur—Operations will be continued until the beginning of 1913, or later. The output, though lessening, is sufficient to keep the mill in operation, and it is planned to continue work as long as expenses can be met.

Washington

King County

A. E. Hanford, of Seattle, has awarded a contract for building a $30,000 dredge to the Schaake Machine Works, of New Westminster.

Stevens County

Lead-Zinc—Work has been started on the foundations for the lead-zinc ore concentrator to be erected on this property near Metaline Falls. J. Jenson is in charge of the work.

Wyoming

Albany County

Utopia Mining & Milling Co.—Active development work is being done on the property of this company in an endeavor to block out enough ore to justify the erection of a stamp mill. Gold ore of good grade has been found in several tunnels, some of which are 500 ft. above the main adit.

Carbon County

The Fram, Klondyke and Cable properties in the Snowy Range district, 12 miles west of Centennial, are now on the shipping list. It is reported that money will be forthcoming in the spring to build a mill and that some custom ore will be treated in it, as other properties

in the district have developed ore that could be profitably treated at a local plant.

FREMONT COUNTY

A. E. Minium, who has been working ground near the Hidden Hand, is in Denver purchasing mining machinery.

Wisconsin

PLATTEVILLE DISTRICT

A local company has been formed to develop the Barreis and Pross land, including the site of the old Hibernia mine, within the city limits of Platteville.

Wisconsin Zinc Co.—This company is drilling on the Wallace and Thompson farms adjoining the Winskell mine in the New Diggings district.

Klar-Piquette—This company is sinking a new shaft on the Weigel land where a discovery of rich zinc ore was made by churn drilling; the company is also drilling on the Seitz farm southwest of Platteville.

Vinegar Hill Zinc Co.—This company is drilling on the Bainbridge land, east of the Gritty Six mine, at Cuba City.

Wallace—This mine, at Highland, has been reopened after having been shut down for two years.

Canada

BRITISH COLUMBIA

Silver Standard—Extensive improvements are to be made at this property near New Hazelton. The mine is owned by Patrick Welsh and associates, of Spokane.

Granby Consolidated—This company will finance the completion of the Hidden Creek smeltery, and the further development of its copper mines out of the treasury, the surplus fund having attained proportions justifying such a decision, according to an announcement of President W. H. Nichols, of the company. Approximately $500,000 has been spent to date in development of the Hidden Creek mines, and at the smeltery site at Granby Bay, and it will require not less than $1,500,000 more fully to mature the plans for that place, which contemplate the erection of a 2000-ton smeltery, a hydro-electric power plant and other buildings. It will require fully another year to complete the project.

NOVA SCOTIA

Dominion Iron & Steel Co.—The output for October exceeded that for any previous month in the company's history, owing to the blowing in of the new blast furnace, bringing the number of furnaces up to five.

ONTARIO

Cleveland—Two cars of machinery, including two 40-hp. boilers and a four-drill compressor, are on the way to this property, in the Manitou Lake gold district.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Nov. 9, and for the year to date, were:

Bailey	.....	21.57
Beaver	64.37	363.75
Buffalo	.....	989.50
Casey Cobalt	.....	255.15
City of Cobalt	.....	887.99
Cobalt Lake	20.70	827.88
Cobalt Townsite	.....	1,641.37
Chamb.-Ferland	.....	427.83
Coniagas	200.38	1,874.33
Crown Reserve	.....	388.21
Drummond	.....	383.05
Hudson Bay	30.90	600.22
Kerr Lake	.....	651.07
La Rose	66.00	3,048.05
Lost and Found	.....	27.80
McKinley-Darragh	63.04	2,278.58
Nipissing	31.62	1,735.62
O'Brien	31.80	292.44
Penn.-Canadian	.....	63.45
Provincial	.....	22.22
Right of Way	.....	242.82
Timiskaming	35.96	884.56
Trethewey	26.50	474.69
Wettlaufer	30.28	376.70
Colonial	.....	63.14
Dominion Reduction Co	.....	56.64
Totals	601.55	18,878.63

Buffalo—The high-grade mill is rapidly approaching completion, and it is hoped to make the first run during the latter part of November. The mill is planned on the general lines of the Nipissing mill for treating high-grade ore.

Cobalt Townsite—The striking miners returned to work on Nov. 5, under the old conditions.

ONTARIO-PORCUPINE

Vipond—The mill has been closed down for a few weeks, in order to make some alterations, which must be made before the cyanide plant is installed.

Plenaurum—Good ore is being obtained from the winze below the 200-ft. level.

Burns—A diamond drill will be installed under the direction of C. R. Pope.

Nighthawk Lake—This property has been sampled by the Canadian Mining & Exploration Co.

Porcupine Lake—A shaft is being sunk to a depth of 400 ft., in order to develop the territory underneath the lake.

North Dome—The work of this company is being retarded by lack of water.

Three Nations—Work on the foundations for a 10-stamp mill has been started.

Scottish Ontario—A vein, showing good ore on the surface, has recently been found.

Tough—A shaft has been started on the No. 2 vein of this Swastika property. Some ore, running as high as $1000 per ton, has been sacked.

Schumacher—This property is to be reopened.

Dome Lake—Good ore has been found in a crosscut from the 180-ft. level.

Mexico

MEXICO

El Oro Mining & R.R. Co., Ltd.—During October, 21,090 tons of ore and 15,920 tons of tailings were treated, from which bullion worth $170,990 was recovered. Working expenses totaled $91,170, net profits $56,750.

PUEBLA

Puebla Smelting & Refining Co.—This company has acquired the Mexican group of claims, aggregating 200 acres. The purchase price is said to be $400,000, and the Antigua mine is included, the ore in which is said to contain about 6% copper and $3 in gold.

SONORA

Greene-Cananea—Much work is now being done on the various properties. At the smeltery the new Great Falls type converters are giving satisfaction and four more are on the way from Milwaukee. The Capote shaft, which is to be used as the main shaft for that property, is down to the 300-ft. level, and will be sunk to the 1000-ft. level before sinking is stopped. It is to be connected on every level with the old shaft, which is a short distance away and the big new orebody will be worked from the new shaft. The Capote orebody is known to extend from the 300- to the 800-ft. level. Drifting on the 900-ft. level is now underway to ascertain the extent of the ore on that level. The whole deposit is sulphide ore, except close to the surface where there is some carbonate. As a whole, it will average between 4% and 5% copper. Shaft No. 12 in Democrata Gulch, has been connected with drifts from the Veta mine, on the third level. A new electric hoist was recently installed. A new electric hoist has been installed at the Duluth shaft. It is the largest electric hoist in the district.

South America

CHILE

Braden—According to a cable, the last 111 meters in the No. 1 Teniente tunnel, or about 350 ft., assayed over 4% copper. This is above the average of reserves, which is placed at 2½% copper. The present development is in a heretofore undeveloped part of the property, and the face of the tunnel is now approximately 1500 ft. beneath the surface. During October, 42,500 tons of ore, containing about 2.8% copper, was treated. In the old mill a recovery of about 61% was made, while on the 46,000 tons treated by the Mineral Separation process the extraction was 75½ per cent.

Africa

TRANSVAAL

Gold production in the Transvaal in October is reported at 768,681 oz., which is 20,788 oz. more than in September, and 60,017 oz. more than in October, 1911. For the 10 months ended Oct. 31. the total was 6,808,095 oz. in 1911, and 7,591,556 oz.—or $156,917,463—in 1912; an increase of 783,461 oz. this year.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Nov. 13—Coal trade in the West continues to suffer from transportation troubles. The scarcity of cars is not quite as acute, but there is still much delay in deliveries.

The seaboard bituminous trade is also in better shape, supplies coming forward more freely than for some time past, though they are hardly sufficient yet.

The anthracite companies are still behind in deliveries. Demand is pressing, but that for domestic coal has eased off a little in consequence of continued mild weather. The steam sizes are in fair supply.

Anthracite shipments in October were the heaviest ever reported for one month, reaching a total of 6,665,321 long tons. For the 10 months ended Oct. 31 the total shipments were 57,645,658 long tons in 1911, and 51,500,540 in 1912; a decrease of 6,145,018 tons, or 10.7%. Only about one-half of the decrease caused by the April-May stoppage has been made up so far.

German Foreign Trade—Exports and imports of fuel in Germany, nine months ended Sept. 30, in metric tons:

	Exports	Imports	Excess
Coal	23,445,270	7,471,865	Exp. 15,943,4351
Brown coal	39,788	5,397,183	Imp. 5,357,390
Coke	4,179,116	439,483	Exp. 3,739,634
Briquettes	2,000,109	126,758	Exp. 1,873,355
Total	29,634,283	13,435,289	Exp.16,198,9[illegible]9

Of the briquettes exported 415,731 tons were made of brown coal or lignite.

Iron Trade Review

New York, Nov. 13—The markets show little change, except that new orders are coming in more freely. Prices continue about the same, but there is more pressure for deliveries, and some premiums are being paid.

The testimony of many steel producers is that there has been no change in the business situation since before the election; in other words, that the election has had no effect. There is reason to believe, however, that there is considerably less forward business being placed than 30 days ago, although this may be simply because buyers are already covered and producers already sold. There is a distinct disinclination on the part of buyers to make commitments after July 1, at any rate with the freedom with which first- and second-quarter business was placed.

As to early delivery business, if the election has had an effect it has been a negative one, for the pressure upon mills for deliveries is undoubtedly greater than it was a fortnight or 30 days ago. Premiums are the rule on finished-steel products, and not simply for prompt shipment, but for any shipment this year.

The basic pig-iron market in the Central West shows apparently a slightly easier tone, for three large interests have made purchases in the week totaling 45,000 tons and secured all the iron at $16, Valley, when advices had been that it might be difficult to pick up any large tonnage even at $16.25. Bessemer has sold freely at $17, the former price. Foundry iron in the valleys, however, has stiffened to $17, furnace.

The scarcity of crude steel has become still more pronounced, one of the signs being the development of several sales of ingots, which are not ordinarily a market commodity. It is probable that some of the independent finishing mills will not be able to run full in the first quarter, having been unable to cover all the steel required.

The United States Steel Corporation reported 7,594,381 tons of unfilled business on books at the close of October, indicating an increase during October of 1,042,874 tons, a record gain for a month, passing the previous record of 942,806 tons in December, 1911. The increase surprised practically the whole steel trade. Shipments having been at substantially the full capacity during the month, or about 1,200,000 tons, it is evident that bookings were almost double the shipments. The corporation sales policy was somewhat different from that of the independents, as it made a special effort to sell against specific jobs, such as structural work and railroad cars, at prices slightly lower than the independents would accept on ordinary contracts. The corporation has foregone $1 or $2 a ton in profits for the privilege of picking its sales and securing the most substantial business possible. Should general conditions become less satisfactory next year, the corporation will be in particularly good position.

Pig Iron Production—The monthly reports of the furnaces, as collected and published by the *Iron Age* show that on Nov. 1 there were 281 coke and anthracite stacks in blast, having a total daily capacity of 88,300 tons: an increase of 5700 tons over Oct. 1. Making allowance for the charcoal furnaces, the estimated production of pig iron in October was 2,720,000 tons; for the 10 months ended Oct. 31 it was 24,234,425 tons. Of this total approximately 17,803,900 tons, or 73.5%, were made by furnaces owned and operated by steel companies.

Baltimore

Nov. 11—Exports for the week included 3,903,323 lb. rails and track material to Cuba. Imports included 81 casks silicospiegel and 1477 tons manganese ore from Liverpool; 279 tons ferromanganese from Rotterdam; 6700 tons manganese ore from Poti, Russia; 15,900 tons iron ore from Cuba.

Birmingham

Nov. 11—Even with the quotations advanced 50c. per ton, there is some business being transacted and pig iron is being sold by Southern manufacturers for delivery during the first and second quarters in next year. Spot iron still sells at $14@14.25 per ton, No. 2 foundry, while $14.50 is the minimum on iron for the first three months in 1913. For the first half, or rather through the second quarter of the year, $15 is the price asked and some sales have been made. The aggregate business transacted the past week is not very strong, but the furnace companies have books well filled for delivery during the rest of this year. The output during October was the largest of any month this year. The production already secured and the prospects for the balance of the month indicate that November's output in the South will also be a record. The railroad-car shortage is being felt by the iron manufacturers, as well as by the coal operators. During the past week a request for five cars with which to move steel billets for export was responded to with one car, while 20 cars needed for moving cast-iron pipe was answered with two cars. The Alabama pig-iron production for October went above 158,000 tons. For the 10 months of the year the production has gone to 1,493,459 tons.

Steel activities are showing further improvement, additional orders for rails having been received. Billets, fabricated steel and steel-wire goods are in demand.

Chicago

Nov. 12—The pig-iron market is quiet, but prices are firm and there is much confidence on the selling side, while melters show no lack of confidence in the continuance of conditions that have made

the market strong for the last six months. Election results seem to have had no effect on the market except to quiet a slight speculative element. Buying continues to be in small lots widely distributed; the average user of pig iron is buying often and piling up a fairly large tonnage. Deliveries for the first half are the rule; a little spot delivery iron is constantly in demand and some requirements for the first quarter only remain to be filled. Beyond the first half there is yet no demand, though inquiries are plentiful and sales may soon occur.

No. 2 Northern pig iron brings $17.50 @18 at furnace, which means 18@18.50 delivered. No. 2 Southern sells for $14.50 at the furnace, or $18.35, Chicago, on most sales, some few perhaps having occurred at 50c. above and below this price. Lake Superior charcoal iron is quiet at $18.75@19, Chicago. No difference is made for deliveries up to the end of the first half on ordinary sales. Furnaces are not striving for business and the buyer of pig iron is manifesting more anxiety about the future than the seller.

Heavy requirements continue in the market for iron and steel products, railroad supplies being specially active. The roads are buying largely for next year's needs, in every line. Structural material has a steady sale, though the volume is not so large as in former weeks, and the difficulty is yet to get the material from the mills in time. Bars are being bought largely in this territory, but from Eastern mills, local producers being sold up far into next year. For sheets, plates and minor lines there is a continuation of the old condition of large demand and limited mill capacity.

Cleveland

Nov. 11—Ore shipments are being rushed and there is again a demand for wild boats.

Pig Iron—The market is quieter, but furnaces are rushed to make deliveries. There is some delay in shipping, owing to scarcity of cars. Bessemer pig is $17.90 and No. 2 foundry $17.25@17.50, Cleveland delivery.

Finished Material—Specifications are coming in heavily, but new orders are not quite so numerous, though some good contracts have been let. Jobbers report a heavy trade from warehouses.

Philadelphia

Nov. 13—The general trend of pig-iron prices is upward. The extraordinary activity in basic and bessemer in this and other markets has precipitated a buying movement, not only for as early delivery as possible but in many cases for delivery far into next year. Not only are stocks exhausted at all but a few scattered furnaces, but there is very little capacity to sell for the rest of the year. Today's nominal quotations for basic shows a further advance than 25c. and the activity in forge iron has taken up a great deal of the remaining capacity for this year as well as first quarter next year and besides, has resulted in marking up quotations 25c. Low phosphorus iron has been very active and foundry grades have moved up. It is impossible to make any statements as to the probable course of the market which would be based on present conditions. Quotations are for No. 2 X foundry $18.50; a few lots of No. 2 plain sold at $18; gray forge is $17.75; basic $18.50 and low phosphorus $24 per ton.

Billets—Basic openhearth rolling billets are not easily to be contracted for and actual prices cannot be given, though the nominal quotation is $32. Forging billets are selling about as usual.

Bars—The bar mills are crowded to the limit. Most of the current business for the past few days has been done at 1.75c. for the best possible delivery and some mills are refusing to load up for the early winter at current rates. Steel bars are selling at 1.85c. for early delivery.

Sheets—Sheet orders are monotonously regular, most of them for large quantities.

Pipes and Tubes—A steady volume of business is being done and stock is not always received according to contract terms. Cast pipe is quiet at present.

Plates—The latest inquiries for plates call for large supplies for early delivery but the requests cannot be accommodated, except to a limited extent. Quotations, 1.75c. delivered. Much new work is in sight.

Structural Material—The mills are meting the requirements with much satisfaction to the consumers and quite an amount of work has been booked within a week for December delivery. Additional shipyard work has just gone to the mills and a batch of orders for bridge work has been booked for scattered delivery during the winter.

Scrap—Scrap is pretty well cleaned up and yardmen's terms are paid without questioning.

Pittsburgh

Nov. 12—The local market has been devoid of important developments in finished steel, unless the increased pressure upon the mills for early delivery, with a decrease in the buying of far forward deliveries may be considered developments. Specifications have been coming in at a very rapid rate, if not as rapid as in October, at least well in excess of shipments, so that mills have a larger volume of specifications on books than at any previous time in this movement, the equal, on an average, to about three months of full operation.

The regular bimonthly settlement of the Amalgamated Association scale for union iron mills in the Central West was made in Youngstown this morning, disclosing an average realized price of shipments of base sizes of iron bars from the selected mills during September and October of 1.3351c., against 1.2518c. in July and August. This advances the puddling rate from $6 to $6.15, for November and December, and other tonnage rates by about 1%. The next settlement will probably put wages on a 1.35c. or 1.40c. basis, giving a further advance of 15 or 30c. in the puddling rate and corresponding advances on other work.

Pig Iron—The Jones & Laughlin Steel Co. has bought 10,000 tons of basic iron for immediate shipment at $16, Valley, this following purchases of 6000 tons by the Republic Iron & Steel Co. for delivery January to June, and 29,000 tons by the Cambria Steel Co. for delivery November to April, all at $16, Valley. The market had been quoted at $16.25, Valley, and it was represented that it might be difficult to pick up any considerable tonnage even at that figure, so that it is possible the market has eased off a trifle. A large tonnage of bessemer has sold at the old figure, $17, Valley, the Republic Iron & Steel Co. taking 24,000 tons for delivery January to June, the Cambria Steel Co. 30,000 tons for delivery November to April and the Youngstown Sheet & Tube Co. 25,000 tons for first quarter. Foundry iron has stiffened, sales being made at $17 and $17.25, Valley. There appears to be a very limited tonnage available, and it is suggested that the furnaces prefer to make basic iron at prices ruling. We quote: Bessemer, $17; basic, $16@16.25; No. 2 foundry, $17@17.25; malleable, $16.50, all f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The scarcity has increased, there being only occasional lots of prompt available. The nominal contract price for the first half of next year is $61, Baltimore, but contracts are only accepted upon occasion. Prompt material is quoted nominally at $70@75, Baltimore.

Steel—A development of the unfinished-steel market illustrating the scarcity is the occasional sale of ingots, one mill having a slight surplus of furnace capacity, and another a slight surplus of rolling capacity, whereby a trade can be made. Ingots have sold at $24@25, maker's mill, generally in about 1000-ton lots. Billets and sheet bars are scarcely quotable, sales being very rare. We quote, largely nominal: Bessemer billets, $26.50; sheet bars, $27; openhearth billets, $27.50; sheet bars, $28, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods have stiffened and are quotable at $30 at mill.

Sheets—Premiums are being paid for any delivery this year, while occasionally contracts are made for next year at a

premium. Specifications continue to exceed shipments, and mills are an average of about 11 weeks behind. We quote: Black sheets, 28 gage, 2.25@2.35c.; galvanized, 28 gage, 3.40@3.50c.; blue annealed, 10 gage, 1.65@1.70c.; painted corrugated, 2.45c.; galvanized corrugated, 3.45c. per pound.

Iron Ore Market

Shipments of iron ore from the Lake Superior region by ports are reported by the Cleveland *Iron Trade Review* for the season to Nov. 1 as follows, in long tons:

Port	1911	1912	Changes
Escanaba	3,764,654	4,663,879	I. 899,225
Marquette	1,956,147	3,082,331	I. 1,126,184
Ashland	2,260,381	4,382,877	I. 2,122,496
Superior	9,315,002	13,100,043	I. 3,785,041
Duluth	6,457,706	9,415,511	I. 2,957,805
Two Harbors	5,853,212	8,703,960	I. 2,850,748
Total	29,607,102	43,348,601	I. 13,741,499

The total increase this year over 1911 was 46.4%.

A sale of 35,000 tons Wabana ore from Newfoundland is reported to an Eastern furnace at 7¼c., f.o.b. cars Philadelphia, equal to 8 or 8¼c. per unit at furnace.

Foreign Iron Trade

German Iron Production—The German Iron & Steel Union reports the make of pig iron in the German Empire in September at 1,479,285 metric tons, being 8163 tons less than in August. The daily average was 49,309 tons in September and 47,982 in August, an increase of 1327 tons. For the nine months ended Sept. 30, the make was, in metric tons:

	1911	1912	Changes
Foundry iron	2,276,678	2,420,577	I. 143,899
Forge iron	400,356	400,905	I. 549
Steel pig	1,285,719	1,594,707	I. 308,988
Bessemer pig	261,083	286,715	I. 25,632
Thomas(basic)pig	7,283,913	8,156,472	I. 872,559
Total	11,507,749	12,859,376	I. 1,351,627

The total increase was 11.8%. Steel pig includes ferromanganese, spiegeleisen and all similar alloys.

Metal Markets

New York, Nov. 13—The metal markets have shown no marked changes from last report, but business continues generally active.

MONTHLY INDEX NUMBERS

Month	1911	1912	Month	1911	1912
January	110	111	July	112	114
February	115	109	August	117	120
March	112	111	September	111	127
April	114	115	October	112	133
May	118	118	November	111	.....
June	115	117	December	110	.....

Year 1909, 115; 1910, 115; 1911, 112.
Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Sept. 1912	$ 568,302	$ 4,200,682	Imp. $3,632,380
" 1911	2,352,861	4,704,096	Imp. 2,351,235
Year 1912	43,728,274	38,789,793	Exp. 4,938,481
" 1911	18,263,310	45,177,106	Imp. 26,913,796
Silver			
Sept. 1912	6,011,221	3,648,883	Exp. 2,362,338
" 1911	4,940,391	4,161,706	Exp. 778,685
Year 1912	52,347,946	36,301,752	Exp. 16,046,194
" 1911	49,527,961	33,696,430	Exp. 15,831,531

Exports from the port of New York, week ended Nov. 9: Gold, $110,000; silver, $813,011, chiefly to London. Imports: Gold, $209,987; silver, $249,460, from Mexico, South America and Australia.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Some gold was taken for India, most of the arrivals going to the Bank of England.

Platinum—The market is steady and unchanged. Dealers here continue to ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium.

Iridium—This metal is quoted at $67@70 per oz., New York.

Palladium—Supplies are rather scarce and $72 per oz. is asked.

Silver—The market is fluctuating between a narrow range of figures. Profit-taking sales by holders in India have checked the advance which was in force when silver touched 29d. in London.

SILVER AND STERLING EXCHANGE

Nov.	7	8	9	11	12	13
New York	62⅞	62⅝	62¾	62¾	62¼	62⅝
London	29	28 11/16	29	28 11/16	28 7/16	28 11/16
Sterling Ex.	4.8560	4.8540	4.8545	4.8535	4.8530	4.8505

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver. 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Oct. 31, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India	£7,558,600	£8,950,500	I. £1,391,900
China	989,700	1,081,000	I. 91,300
Total	£8,548,300	£10,031,500	I. £1,483,200

India Council bills in London brought an average of 16.06d. per rupee for the week.

Shipments of gold from London to India continue heavy.

Gold in the United States, Nov. 1, as estimated by the Treasury Department: Held against gold certificates outstanding, $1,056,017,169; in treasury current balances, $190,203,780; in banks and circulation, $610,614,208; total, $1,856,835,157, an increase of $15,452,722 during October.

Coined silver in the United States, Nov. 1, as estimated by the Treasury Department: Standard dollars held against silver certificates, $489,266,000; standard dollars in treasury balances and in circulation, $76,176,020; subsidiary coins, $172,078,534; total, $737,520,554, an increase of $4,848,068 in October.

NEW YORK

Nov.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
7	17⅛ @17⅝	17.20 @17.25	50⅛	4.65 @4.75	4.50 @4.55	7.35 @7.45	7.20 @7.30
8	17⅛ @17¾	17.25 @17.30	50⅛	4.65 @4.70	4.50 @4.55	7.35 @7.45	7.20 @7.30
9	17⅛ @17¾	17.25 @17.30	50⅛	4.65 @4.70	4.50 @4.55	7.35 @7.45	7.20 @7.30
11	17⅛ @17¾	17.25 @17.35	49⅜	4.62½ 4.67½	4.47½ @4.52½	7.40 @7.50	7.25 @7.30
12	17⅛ @17¾	17.25 @17.35	49⅜	4.62½ 4.67½	4.47½ @4.52½	7.40 @7.50	7.25 @7.30
13	17⅛ @17¾	17.25 @17.35	50	4.62½ 4.67½	4.47½ @4.52½	7.40 @7.50	7.25 @7.30

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Nov.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
7	76⅛	77¼	82	229	229	18¼	27⅜
8	76½	77⅛	82	229	229¼	18⅜	27⅜
9	....	....	....	.....	.....	....	....
11	76½	77⅛	82	227	226¾	18⅜	27¼
12	76⅜	77⅛	82	227	226¾	18⅜	27⅛
13	77⅛	77⅞	82¼	228¼	228	18¾	26⅞

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

Copper—At the beginning of the week an improvement in demand became manifest, which was thought to be the forerunner of general replenishment of stocks by manufacturers, but the movement quickly petered out and the market became dull again. Several millions

of pounds of electrolytic were sold at a small advance, both to domestic and foreign buyers. The highest price realized was 17½c., delivered, usual terms, and at the close electrolytic copper is freely offered at that price. Some small sales of Lake copper are reported as high as 17.70@17.75c., cash, New York. The largest agencies are maintaining the pegged price of 17¾c. for electrolytic copper and expecting the market to come to them when buyers have sufficiently starved themselves, and the expected is likely to be the consummation. At the close Lake copper is quoted at 17½@17¾c.; and electrolytic in cakes, wirebars or ingots, 17.25@17.35c. Casting copper is quoted nominally at 17.10@17.15c. as an average for the week.

The London market for standard copper fluctuated within narrow limits at around £76½@77⅝ for spot and £77⅛@77¾ for three months until Nov. 13, when a decidedly better feeling made itself felt and spot advanced to £77⅝ and three months to £77⅞.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Copper exports from New York for the week were 4309 long tons. Our special correspondent gives the exports from Baltimore at 276 tons for the week.

Tin—On Nov. 11 the market, which had ruled steady during the remainder of last week, became weak and declined almost £2½. This was ascribed to larger shipments from the Straits, which will unfavorably affect statistics. At the same time, orders which were expected in the London market from this side failed to materialize. Instead, domestic sellers appeared rather anxious to liquidate their holdings and were eagerly competing for consumers' orders. The market closes steady at £228¼ for spot and £228 for three months, and at about 50c. for November tin here.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in September, at 2358 tons, including 2338 tons from Bolivia and 20 tons from South Africa.

Lead—The entrance of a new producer into the market has been disturbing. Several interests have been pressing lead for sale during the last week, and the demand being not very good, the market has receded materially from the schedule named by the A. S. & R. Co. At the close, New York is quoted at 4.62½@4.67½c., and St. Louis at 4.47½@4.52½c.

The London market for lead is unchanged at £18⅜ for Spanish and £18½ for English lead.

Spelter—The market is quiet. A fair business is reported at somewhat better prices, particularly for early shipment. At the close St. Louis is quoted at 7.25@7.30c.; New York, 7.40@7.45c.

The London market for good ordinaries held around £27⅜ until Nov. 12, when it declined to £27⅛, and closed on Nov. 13 at £26⅞ for good ordinaries and £27⅛ for specials.

Zinc dust is quoted 7¾c. per lb., New York.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Imports and Exports of Metals

Exports and imports of metals in the United States, nine months ended Sept. 30, are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports	Excess
Copper, long tons	276,450	134,231	Exp. 142,219
Copper, 1911....	264,047	115,472	Exp. 148,575
Tin, long tons....	432	39,090	Imp. 38,658
Tin, 1911.....	920	37,840	Imp. 36,920
Lead, short tons.	51,171	67,264	Imp. 16,093
Lead, 1911.....	78,830	68,314	Exp. 10,516
Zinc, short tons..	6,520	5,215	Exp. 1,305
Zinc, 1911.....	4,426	1,325	Exp. 3,101
Nickel, lb.....	19,359,538	29,501,031	Imp.10,141,493
Nickel, 1911....	18,888,877	21,901,523	Imp. 2,012,646
Antimony, lb.....	50,684	13,067,813	Imp.13,017,129
Antimony, 1911.	160,844	7,824,178	Imp. 7,663,334
Platinum, oz.....	.....	76,600	Imp. 76,600
Platinum, 1911.	95	89,696	Imp. 89,601
Aluminum, lb....	211,086	13,158,551	Imp.12,947,465
Aluminum, 1911	.....	.....	.....
Ores, etc.			
Zinc in ore, lb...	13,480,634	24,568,311	Imp.11,087,677
In ore 1911....	16,396,226	26,279,745	Imp. 9,883,519
Zinc oxide, lb. ..	26,684,147	.....	Exp.26,184,147
Zinc oxide, '11..	21,176,252	.....	Exp.21,176,252
Zinc dross, lb....	403,918	.....	Exp. 403,918
Zinc dross, '11..	7,170,517	.....	Exp. 7,170,517
Chrome ore, l.t..	.....	36,646	Imp. 36,646
Chrome ore, '11	5	28,386	Imp. 28,381

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Quantity of zinc ore imported in 1912 was 33,001 tons; exported, 17,815. Imports of aluminum were not reported previous to July 1, 1911. Exports of manufactures of aluminum were valued at $945,668 this year. The metal exports given above, include re-exports of foreign materials.

Other Metals

Aluminum—The market has been rather quiet and prices are not quite so firm. Quotations for early deliveries continue at 27c. per lb. for No. 1 ingots. Futures are off, at about the same price.

Antimony—Business has been rather more quiet, but the undertone of the market is firm. There has been some liquidation of stocks, chiefly in the outside brands, but it is about over. Cookson's is quoted at 10⅜@10½c.; Hallett's 9⅞@10¼c.; while 9¼@9½c. per lb. is named for Chinese, Hungarian and other outside brands.

Quicksilver—Business is good and the market here is steady, with no material changes in prices. New York quotations are $42 per flask of 75 lb., with 60c. per lb. asked for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. London price is £7 12s. 6d. per flask, with £7 10s. named from second hands.

Cadmium—The latest quotation from Germany is 725@750 marks per 100 kg., f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

Nickel—Shot, blocks and plaquettes bring 40@45c. per lb., according to quality. Electrolytic nickel is 3c. per lb. higher.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 9—The base price paid this week for 60% zinc ore was $54@55. The base price offered for lead ore was $60 per ton of 80% lead.

SHIPMENTS WEEK ENDED NOV. 9

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton.....	718,300	.....	838,600
Mineral Point.....	684,800	.....	.....
Platteville.....	619,780	.....	146,000
Shullsburg.....	600,000	.....	.....
Galena.....	444,500	.....	.....
Highland.....	348,200	.....	.....
Hazel Green.....	300,000	.....	.....
Rewey	85,000	.....	.....
Linden.....	66,260	.....	.....
Harker.....	63,490	.....	.....
Montfort.....	60,000	.....	.....
Cuba City.....	50,000	.....	64,660
Total.....	4,040,330	.....	1,049,260
Year to date.....	173,026,180	7,218,960	32,179,210

Shipped during week to separating plants, 2,111,190 lb. zinc ore.

Joplin, Mo., Nov. 9—The high price for zinc sulphide ore is $60, the base per ton of 60% zinc $52@57. Zinc silicate sold at $30@33 per ton of 40% zinc. The average price for all grades of zinc is $53.80. Lead sold at $57@59 per ton of 80% metal, the market weakening all through the week. No ore assaying above 80% metal was sold. The average for all grades of lead was $58.44 per ton.

Lack of cars for ore transportation is responsible for the zinc shipment lowering each of the past three weeks. The smelters are buying the ore and own the

SHIPMENTS WEEK ENDED NOV. 9

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,430,700	.....	1,004,230	$151.441
Joplin.....	2,526,930	.....	253,380	78.100
Duenweg.....	860,440	.....	64,500	25.531
Galena.....	491,680	.....	198,640	19,280
Miami.....	367,300	.....	357,610	19,185
Alba-Neck.....	602,490	.....	21,220	17,784
Carl Junction	357,480	.....	3,510	10,469
Granby	14,300	435,700	10,640	8,350
Jackson	241,070	.....	55,740	8,125
Wentworth...	258,910	.....	.....	6,731
Carthage	126,640	.....	.....	3,292
Spurgeon	.....	64,610	76,220	3,244
Oronogo.....	118,040	.....	.....	2,168
Lawton	110,210	.....	.....	2,142
Springfield ..	68,800	.....	.....	2,100
Quapaw.....	63,300	.....	.....	1,580
Cave Springs	62,430	.....	.....	1,717
Aurora.....	52,110	.....	.....	1,300
Totals.....	10,752,830	500,310	2,045,690	$362,539
45 weeks....	484,609,930	30,268,820	81,194,930	$15,766,019

Blende val., the week, $294,011; 45 weeks, $12,970,632
Calamine, the week, 8,734; 45 weeks, 478,460
Lead value, the week, 59,794; 45 weeks, 2,316,927

reserve stock in the bins at the mines with the exception of possibly 1000 tons, most of which is held for a higher level of prices.

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October	42.38	57.00	40.89	55.97	54.72	63.22
November	45.40	.....	43.25	.....	57.19	.....
December	44.13	.....	40.76	.....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Zinc Ore Prices

Zinc ore is not commonly bought by American smelters upon a formula, but if their terms be translated into those of a formula they would agree fairly with the following, in which V is the value of 2000 lb. of ore, P is the price of spelter at St. Louis in cents per pound, and T is the number of units of zinc in the ore, R being the returning charge, which is variable.

$$V = 20P(T - 8) - R$$

At present, calamine ore is in strong demand and the returning charge may be as low as $13@14 per ton, delivered at smelter's works. On Rocky Mountain blende, on the other hand, returning charge at present would probably be in the neighborhood of $20 per ton.

Reduced to the terms of this formula, the present returning charge on Joplin blende is about $19 f.o.b. Joplin, and on calamine about $13.50 per ton.

Chemicals

New York, Nov. 13—Washington dispatches report that the representatives of a Norwegian company are trying to secure control of a large water power in Oregon, for the purpose of establishing there the manufacture of nitrogen compounds.

Arsenic—Spot supplies are better and there is less pressure to secure material. The market is easier, $5@5.12½ per 100 lb. being asked for spot and $4.62½ for futures.

Copper Sulphate—Trade is good and the market is steady. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Trade is rather quiet, but the market is steady. Quotations are 2.57½c. per lb. for both spot and futures.

Petroleum

Production of petroleum in California for the nine months ended Sept. 30 was 66,534,217 bbl., an increase of 4,729,895 bbl.; consumption was 61,113,326 bbl., an increase of 8,184,640 bbl. over last year.

Mining Stocks

New York, Nov. 13—On Nov. 7, after election, there was a marked recovery on the Exchange. The Curb was also active, mining stocks selling well at firm prices.

Nov. 8, there was some reaction from the previous advances on the Exchange, but it was followed by general recovery. On the Curb there was a sharp advance in Braden Copper, but other coppers were quiet, and trading in the rest of the mining stocks was slow.

Nov. 9, the Exchange was strong, though affected by the general weakness abroad. Mining stocks on the Curb were dull and irregular.

Nov. 11 the Exchange was dull and inclined to weakness. The Curb was dull. Braden Copper advanced, but was the only mining stock selling well.

Nov. 12 and 13 the Exchange was irregular, small declines and recoveries alternating. The Curb was rather quiet and mining stocks were not in much demand, but were generally firm.

Boston, Nov. 12—Notwithstanding the weakness of the general market, copper shares have been giving a good account of themselves since election. The activity has been chiefly in spots, although this has resulted in generating some activity in other and lesser companies. The further increase in the American surplus copper during October does not seem to enter as a market factor,

Granby Consolidated has, by all odds, been the feature of the market, advancing over $15 during the week to $77.75. This price is within $2.25 of the price stockholders paid for the new stock during the early part of 1910, or just before the perpendicular drop to $30 occurred. Utah Consolidated responded to the declaration of the $1 dividend, by advancing $3 to $14.25.

This declaration is believed to be but the start of many more increases to come. Directors of eight other copper-mining companies will meet within the next two or three weeks for dividend action—Quincy, Copper Range, Calumet & Arizona, Calumet & Hecla, St. Mary's Mineral Land, Shannon, Utah Copper and Nevada Consolidated. Shattuck & Arizona has risen $8.25 to $34.25 on a revival of reports of consolidation with the Calumet & Arizona. In the lesser stocks, Superior & Boston has risen, and there is talk here of a consolidation with the Arizona Commercial.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	August	Sept.	October
Alaska shipments	1,242,836	1,726,71[illegible]	,435,235
Anaconda	25,250,000	24,500,00[illegible]	25,250,000
Arizona, Ltd	3,260,000	3,340,000	3,200,000
Copper Queen	8,040,424	9,103,861	8,184,575
Calumet & Ariz	4,514,000	4,462,000	4,404,000
Chino	3,485,278	3,217,369	3,638,500
Detroit	1,882,289	1,881,668	1,934,828
East Butte	1,410,500	1,250,000	.....
Mammoth	1,802,590	1,834,937	.....
Giroux	774,844	1,005,208	.....
Mason Valley	1,384,000	1,200,000	1,563,700
Nevada Con	6,551,030	5,607,578	.....
Ohio	620,000	.....	.....
Old Dominion	2,597,896	2,204,000	2,523,000
Ray	2,902,715	2,978,404	.....
Shannon	1,400,000	1,142,000	1,210,000
South Utah	224,855	225,568	.....
United Verde*	2,500,000	2,750,000	.....
Utah Copper Co	11,248,992	6,616,887	.....
Lake Superior*	21,000,000	19,250,000	21,500,000
Non-rep. mines*	8,195,156	8,094,792	8,250,000
Total production	110,211,367	.....	.....
Imports, bars, etc.	23,561,161	.....	.....
Total blister	133,772,528	.....	.....
Imp. in ore & matte	8,544,624	.....	.....
Total American	142,307,152	.....	....
Miami†	3,048,750	2,949,150	2,577,750
Brit. Col. Cos.:			
British Col. Copper	941,364	.....	1,013,000
Granby	1,970,388	2,083,118	.....
Mexican Cos.:			
Boleo†	.....	.....	.....
Cananea	4,044,000	3,500,000	4,248,000
Moctezuma	3,229,839	771,844	3,045,667
Other Foreign:			
Cape Cop., S. Africa	.....	.....	....
Kyshtim, Russia	1,400,000	1,750,000	....
Spassky, Russia	902,720	981,120	.....
Tilt Cove, Newf'd	.....	.....	.....
Exports from:			
Chile	8,512,000	6,048,000	8,512,000
Australia	8,064,000	7,616,000	9,520,000
Arrivals in Europe‡	20,200,320	8,518,720	13,771,520

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
X, 1911	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167 904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150
IX	140,089,819	63,460,810	60,264,796
X	145,405,453	84,104,734	47,621,342

	Visible Stocks		
	United States	Europe	Total
XI, 1911	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374
X	63,065,587	107,408,000	170,473,587
XI	76,744,964	103,801,600	180,546,564

Curb trading has been of good volume, and prices, in the main, have been strong. The old Rhode Island Coal Co. has been ordered shut down and the stock of its successor company, Portsmouth Coal Mining Co., was quoted 3c. bid, 10c. asked.

Assessments

Company	Delinq	Sale	Amt.
Alpha Con., Nev.	Nov. 13	Dec. 4	$0.03
Best & Belcher	Nov. 6	Nov. 25	0.05
Buffalo, Ida	Oct. 28	Nov. 28	0.002½
Consolidated Virginia, Nev.			0.15
Crown Point, Nev.	Nov. 11	Dec. 4	0.10
Crown Point, Utah	Nov. 15	Dec. 10	0.01
Eastern Star, Ida.	Oct. 12	Nov. 12	0.003
Exchequer, Nev.	Oct. 30	Nov. 20	0.03
Franklin, Mich.	Oct. 18		2.00
Laclede, Ida.	Nov. 18	Dec. 9	0.003
Holy Terror, Ida.	Oct. 18	Nov. 18	0.00½
Hub, Ida.	Nov. 14	Dec. 14	0.001
Hugo, Ida.	Nov. 9	Dec. 9	0.001
Indiana, Mich.	Oct. 16		1.00
Leroy Gold & Copper, Ida.	Nov. 28	Dec. 28	0.002
Mayflower, Ida	Nov. 27	Dec. 27	0.005
Melcher, Utah	Nov. 23	Dec. 12	0.02
National Copper, Ida.	Nov. 15	Dec. 10	0.01
North Star, Ida.	Nov. 30	Dec. 30	0.001
Oneco, Mich.	Oct. 10		1.00
Ophir, Nev.	Nov. 11	Dec. 9	0.15
Rhode Island, Ida.	Oct. 31	Nov. 30	0.00½
Sierra Nevada, Nev.			0.10
Sunshine, Ida.	Oct. 30	Nov. 30	0.001
Tar Baby, Utah	Nov. 2	Dec. 2	0.002½
Yellow Jacket, Nev.	Oct. 30	Dec. 3	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59 043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60 880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63 078	24.567	24.209	29 088
October	55.490	53.340	63.471	25.596	24.594	29.299
November	55.635	55.719		25.680	25.649	
December	54.428	54.905		25.160	25.349	
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62 893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17 234	12.611	17 443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78 670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189	17.314	12.370	17.661	55.170	76.389
November	12.616		12.769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634		55.973	

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42 529	July	42 400	44 519
February	41 614	42.962	August	43 319	45 857
March	40.157	42.577	September	39 755	49.135
April	42.185	43.923	October	41.185	50.077
May	43.115	46.053	November	43.125	
June	44.606	45 815	December	44.655	
			Av. Year	42.281	

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.266	3.946	13.043	15 738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16 331
May	4.373	4.194	4.223	4 072	12.984	16 509
June	4.435	4.392	4.292	4.321	13.260	17 588
July	4.499	4.720	4.397	4.603	13.530	18 544
August	4.500	4.569	4.406	4.452	14.260	19 655
September	4.485	5.048	4.356	4.924	14 744	22.292
October	4.265	5.071	4.139	4.894	15.332	20.630
November	4.298		4.181		15.821	
December	4.450		4.332		15.648	
Year	4.420		4.286		13.970	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26 661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6 483	23.743	25 644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6 727	24.612	25.763
July	5.695	7.116	5 545	6.966	25.006	26 174
August	5 953	7.028	5 803	6.878	26 801	26.443
September	5 869	7.454	5 719	7 313	27 750	27.048
October	6.102	7.426	5.951	7.276	27.256	27.543
November	6.380		6.223		26.795	
December	6.301		6.151		26.849	
Year	5.758		5.608		25.281	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15 90	15.03	14 50	13.28	14.81	14.01
March	15.90	14.95	14 65	13.66	14.96	14.10
April	15 90	15.13	14 65	13.90	15.00	14.15
May	15 90	15.14	14 30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15 90	15.43	14 00	14.90	14 47	14.85
September	15 90	16.86	13 57	16.03	14.40	15.63
October	15.43	17.90	13.44	17.18	14.34	17.22
November	14.92		13.30		14.25	
December	15.15		13.10		13.90	
Year	$15.72		$13.94		$14.49	

STOCK QUOTATIONS

COLO. SPRINGS Nov. 12

Name of Comp.	Bid.
Acacia	.04½
Cripple Cr'k Con.	.01⅜
C. K. & N.	.16⅜
Doctor Jack Pot	.06
Elkton Con.	.64½
El Paso	5.40
Findlay	.04⅝
Gold Dollar	.19½
Gold Sovereign	.02½
Isabella	.21⅛
Jack Pot	.04½
Jennie Sample	.06½
Lexington	.006
Moon Anchor	.01
Old Gold	.03½
Mary McKinney	.73
Pharmacist	.01½
Portland	1.04
Vindicator	.88
Work	.01½

SALT LAKE Nov. 12

Name of Comp.	Bid.
Beck Tunnel	.09
Black Jack	.10
Cedar Talisman	.01
Colorado Mining	.15
Columbus Con.	.10
Crown Point	.03½
Daly-Judge	6.00
Grand Central	.69
Iron Blossom	1.15
Little Bell	.75
Lower Mammoth	.05
Mason Valley	12.00
May Day	.16
Nevada Hills	1.50
New York	.60½
Prince Con	1.70
Silver King Coal'n	3.15
Sioux Con.	.02¾
Uncle Sam	.12
Yankee	.12

TORONTO Nov. 12

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.50	Foley O'Brien	.25
Hudson Bay	‡63.00	Hollinger	14.75
Temiskaming	.42½	Imperial	.02½
Wettlaufer-Lor.	.24	Pearl Lake	.22
Am. Goldfield	‡.40	Porcu. Gold	.18½
Apex	.01½	Preston E. D.	.02½
Crown Chartered	.02⅞	Rea	.35
Dobie	‡.25	Standard	‡.01
Dome	20.12½	Swastika	.08½
Dome Exten.	.10½	West Dome	‡.13

SAN FRANCISCO Nov. 12

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	9.00
Belcher	.31	Jim Butler	.60
Best & Belcher	.05	MacNamara	.19
Caledonia	.99	Midway	.41
Challenge Con.	.02	Mont.-Tonopah	2.00
Chollar	.02	North Star	.32
Confidence	.40	West End Con.	1.65
Con. Virginia	.36	Atlanta	.17
Crown Point	.31	Booth	.05
Gould & Curry	09	C.O.D. Con.	.05
Hale & Norcross	.11	Comb. Frac.	.10
Mexican	1.80	Jumbo Extension	.31
Occidental	70	Pitts.-Silver Peak	.90
Ophir	.51	Silver Pick	.07
Overman	.37	St. Ives	‡.30
Potosi	.04	Tramp Con.	.02
Savage	.08	Argonaut	‡2.00
Sierra Nevada	.35	Bunker Hill	‡4.50
Union Con.	.42	Central Eureka	‡.20
Yellow Jacket	.40	So. Eureka	‡2.00

N. Y. EXCH. Nov. 12

Name of Comp.	Clg.
Amalgamated	84¼
Am. Agri. Chem.	56⅞
Am.Sm.&Ref.,com	80
Am. Sm. & Ref., pf.	107¾
Am. Sm. Sec., pf. B	84
Anaconda	43½
Batopilas Min.	1⅝
BethlehemSteelpf	73½
Chino	48¾
Federal M. & S., pf.	44
Goldfield Con.	2⅝
GreatNor.,ore,,ctf.	46
Guggen. Exp.	55¼
Homestake	98
Inspiration Con.	20⅛
Miami Copper	28⅛
Nat'nalLead,com.	61⅛
National Lead, pf.	110
Nev. Consol.	22
Phelps Dodge	215⅜
Pittsburg Coal, pf.	92
Ray Con.	22¼
Republic I&S,com.	29⅛
Republic I & S, pf.	92
SlossSheffi'd,com.	55
Sloss Sheffield, pf.	95
Tennessee Copper	41⅛
Utah Copper	63¾
U. S. Steel, com	75⅛
U. S. Steel, pf.	112¼
Va. Car. Chem.	45½

N. Y. CURB Nov. 12

Name of Comp.	Clg.
Barnes King	‡.60
Beaver Con.	.40
Braden Copper	8⅞
B. C. Copper	4½
Buffalo Mines	2⅛
Caledonia	.40
Con. Ariz. Sm.	1/16
Davis-Daly	2⅛
Diam'field-Daisy	6
Ely Con.	.19
Florence	.72
Giroux	4⅜
Gold Hill Con.	1/16
Greene Cananea	9⅜
Greenwater	.05
Internat. S. & R.	‡124
Kerr Lake	2 11/16
Keystone	2
La Rose	2⅛
McKinley-Dar-Sa.	2¼
Min. Co. of A. new	2⅞
Motherlode Gold.	‡1/16
Nev. Utah M. & S.	‡.01
Nipissing Mines	8¼
Ohio Copper	1⅝
Pacific Sm. & M.	¼
Puebla S. & R.	‡1 11/16
South Live Oak	2
South Utah M. & S.	5/16
Standard Oil (Old)	1110
Stand'd Oil of N.J.	395
Stewart	1 5/16
Tonopah	6⅜
Tonopah Ex.	2⅝
Tonopah Merger	.92
Tri-Bullion	¾
Tularosa	1 1/16
Union Mines	‡.10
United Cop., pfd.	10
Yukon Gold	3¼

LONDON Nov. 13

Name of Com.	Clg.
Camp Bird	£1 5s 3d
Dolores	1 10 0
El Oro	0 17 6
Esperanza	1 19 3
Mexico Mines	6 15 0
Oroville	0 5 0
Stratton'sInd.	0 3 1½
Tomboy	1 7 0

BOSTON EXCH. Nov. 12

Name of Comp.	Clg.
Adventure	‡6
Ahmeek	‡330
Algomah	3¼
Allouez	‡39½
Am. Zinc	31¾
Ariz. Com., ctfs.	4⅜
Bonanza	.30
Boston & Corbin	6¼
Butte & Balak	‡3⅞
Calumet & Ariz	78¾
Calumet & Hecla	570
Centennial	‡19
Cliff	‡3
Copper Range	56
Daly West	3⅝
East Butte	15¼
Franklin	10½
Granby	76¼
Hancock	24
Hedley Gold	‡25
Helvetia	.85
Indiana	17½
Island Cr'k, com.	‡55
Island Cr'k, pfd.	88
Isle Royale	34¼
Keweenaw	‡2
Lake	30¾
La Salle	5¼
Mass	6½
Michigan	2
Mohawk	63
New Arcadian	2½
New Idria Quick.	‡7
North Butte	36
North Lake	4
Ojibway	3
Old Dominion	59
Osceola	107
Quincy	85
Shannon	14½
Shattuck-Ariz.	34
Superior	43
Superior & Bost.	2¾
Tamarack	‡41
Trinity	5¼
Tuolumne	‡2¾
U. S. Smelting	45¾
U. S. Smelt'g, pf.	50½
Utah Apex	1¾
Utah Con.	13½
Victoria	‡2½
Winona	4½
Wolverine	76
Wyandot	‡1¼

BOSTON CURB Nov. 12

Name of Comp.	Last
Alaska Gold M.	8⅜
Bingham Mines	4¾
Boston Ely	1 1/16
Boswyocolo	.01
Butte Central	6 1/16
Cactus	.08
Calaveras	2⅞
Chief Cons	1½
Corbin	.27
Cortez	⅜
Crown Reserve	3½
First Nat. Cop.	2⅜
Majestic	43
Mazatan	⅛
Moneta Porc.	‡.04½
Nevada-Douglas	3½
New Baltic	1½
Oneco	2½
Raven Copper	.27
Portsmouth Coal	.03
San Antonio	‡3
Smokey Dev.	2½
S. W. Miami	5½
South Lake	6⅝
Trethewey	.30
United Verde Ext.	.55

‡Last quotation.